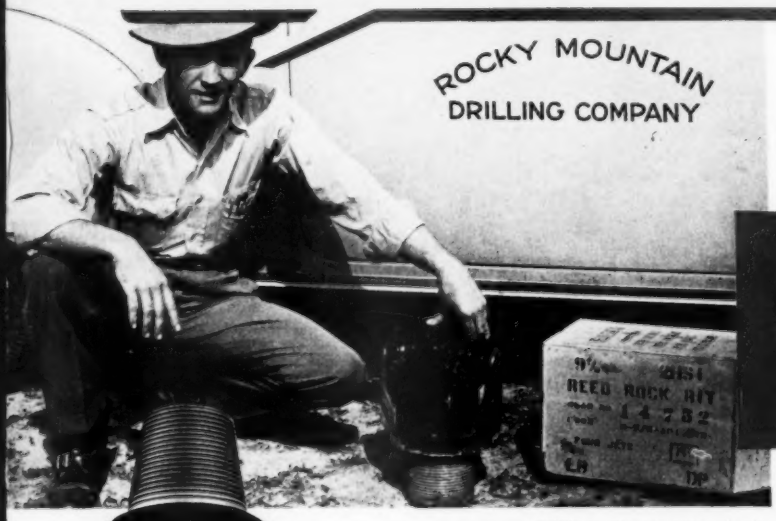
the OIL AND GAS JOURNAL

I like this bit for hard, abrasive drilling



. . . says H. A. Stripling, tool pusher in California for the Rocky Mountain Drilling Co.

REED
Liquid Blast
ROCK BITS

"I run **REED** 2HS-1 Rock Bits in hard, abrasive formations because I can depend on getting fast drilling and good footage. They can't be beat for hard-formation drilling.

"At best, hard formations are expensive to drill, but I find that **REED** 2HS-1 Bits help me keep costs down."

For good long runs use the **REED** *"LB"*

REED ROLLER BIT COMPANY

HOUSTON 1, TEXAS

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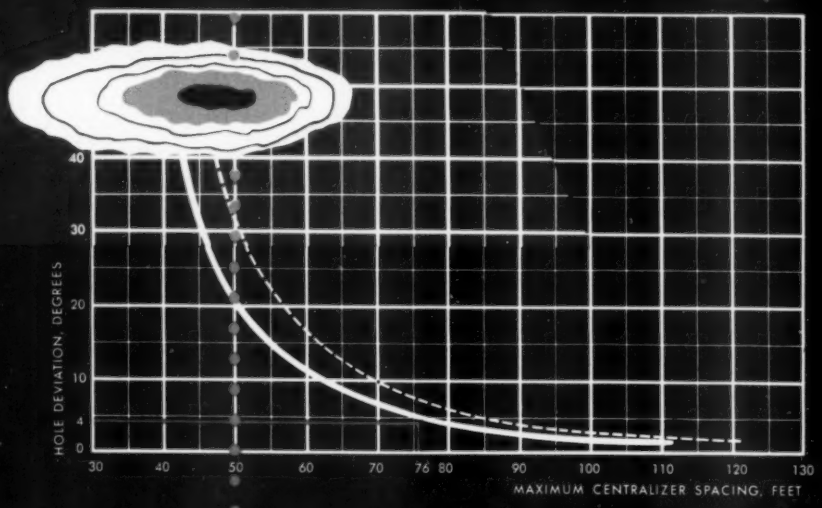
PRICE 50 CENTS TABLE OF CONTENTS PAGE 53 **JULY 19, 1951**

JUST ONE SIZE HALLIBURTON CENTRALIZER FOR ALL COMMON HOLE SIZES!



HALLIBURTON CENTRALIZERS

HALLIBURTON S-3 CENTRALIZERS simplify ordering and warehousing because only one size is required for each casing O.D. size. In addition to this saving, exhaustive permanent-set and load-deflection tests have proved HALLIBURTON S-3 CENTRALIZERS to have less loss of bowed-height and greater effective centering force than any other centralizer on the market. HALLIBURTON has prepared a complete set of maximum spacing charts showing maximum spacing between centralizers at various hole deviations up to 50°, for all common hole sizes. They're Free . . . Ask for your copy today.

"There's no substitute for experience in oil well cementing."

HALLIBURTON OIL WELL CEMENTING CO.

DUNCAN, OKLAHOMA

This Assembly is Ready to Go

Here's an assembly that's ready to go to work in a wide variety of high-temperature, high-pressure bolting applications. It consists of the Bethlehem Alloy Steel Continuous-Thread Stud, and two Bethlehem Quenched Nuts.

The Bethlehem Alloy Steel Continuous-Thread Stud is ideal for economical high-temperature, high-pressure bolting because it minimizes stress concentrations. There being no point of thread runout, stress concentrations can't concentrate at any one point, but instead are effectively distributed over its entire working length.

And the Bethlehem Quenched Nut, supplied with the Bethlehem Alloy Stud, has plenty of staying power because of its built-in strength. The quenched nut is unlike ordinary nuts because it is made by forging and extruding hot metal into a forming die, after which it is quenched and tempered. This procedure provides sufficient strength for the nut to break virtually any stud or bolt on which it may be used.

Bethlehem Alloy Continuous-Thread Studs and Quenched Nuts are made in a complete range of sizes. They form an effective, long-lasting combination for high-temperature bolting—one that's well worth looking into.

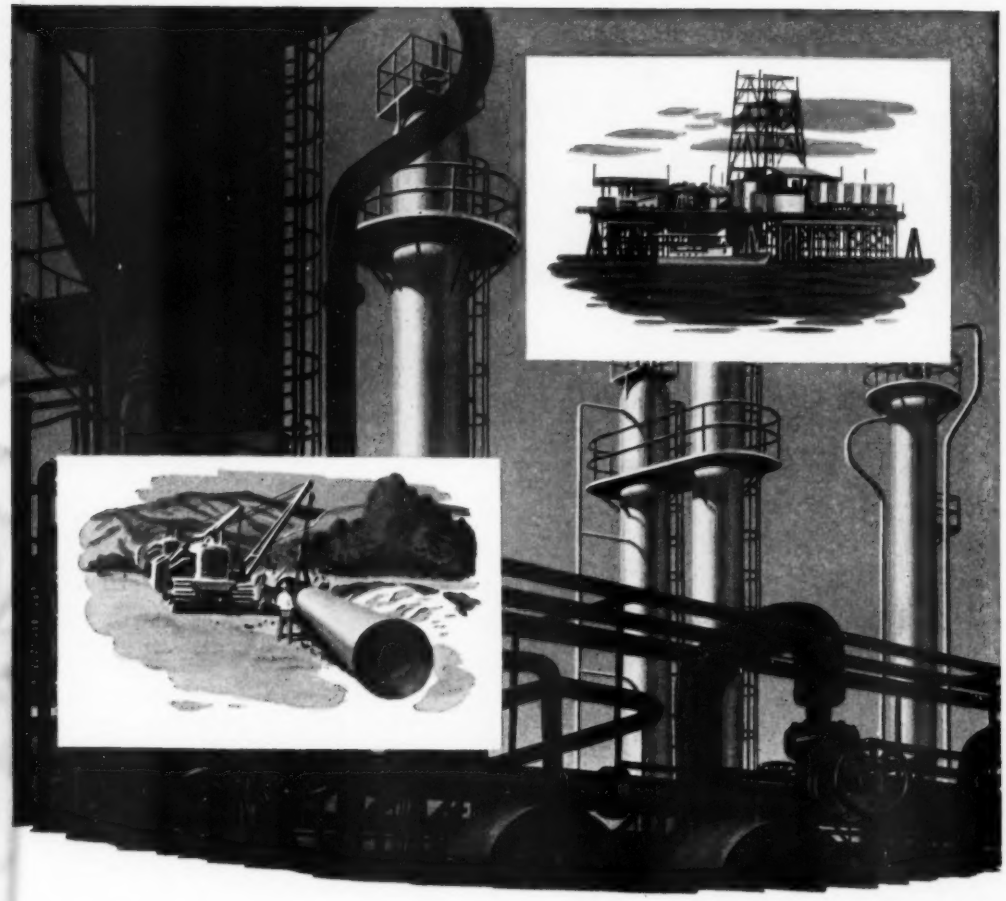
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Bethlehem supplies every type of Fastener

The Oil and Gas Journal, published Thursdays by The Petroleum Publishing Company. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. U. S. and foreign rates to the petroleum industry, $3 yearly. Copyright 1951.



The Petroleum Industry...and *Brown & Root*

IN A BRIEF HALF CENTURY the petroleum and natural gas industry has grown from a fledgling to a multibillion dollar annual business. Each and every year millions of dollars are plowed back by the industry to build greater reserves and to process and distribute its vitally important products.

Like many other great industries in the Southwest, the petroleum industry relies upon the services of Brown & Root for its construction and expansion programs. Brown & Root offers experienced counsel backed by more than thirty years of successful engineering and construction in the Southwest. This experience plus loyal personnel often results in faster, more economical completion of any proposed project. If your firm contemplates construction or expansion in the Southwest a request will put Brown & Root plant planning experts at your disposal.

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An Extra Lung for A Man

HAVING TROUBLE BREATHING

The amount of work a man can do goes *down* when foul air comes *in* or the heat goes *up*. Are you giving your workers the equipment that will keep them efficient even when working in hot or noxious fumes?

Many concerns regard Coppus Blowers as "production tools" as well as "safety equipment". They help men to do more work and better work.

You can find in the Coppus line the right blower or exhauster for each "bad spot"—or perhaps one type will handle a variety of jobs. In addition to man-cooling and removing fumes from confined places, Coppus Blowers are used for cooling and drying materials and equipment. They are portable . . . efficient . . . built to Coppus "Blue Ribbon" standards of construction and workmanship in order to withstand severe usage.

Check and mail the coupon for specific information. Coppus Engineering Corp., Worcester 2, Mass. Sales Offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in BEST'S SAFETY DIRECTORY, CHEMICAL ENGINEERING CATALOG, REFINERY CATALOG.

ANOTHER
COPPUS
"BLUE RIBBON" PRODUCT

COPPUS ENGINEERING CORP., 268 PARK AVENUE, WORCESTER 2, MASS.
Please send me information on the Blowers that clear the air for action.

- ☐ in tanks, tank cars, drums, etc.
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- ☐ stirring up stagnant air wherever men are working or material is drying.

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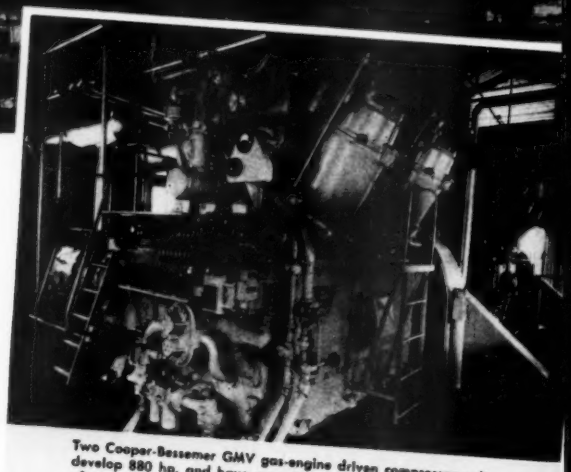
(Write here any special ventilating problem you may have).



Two Cooper-Bessemer GMV gas-engine driven compressor units develop 880 hp. and have capacity to deliver 5,000,000 cu. ft. of gas at 450# pressure.

This complete GATHERING SYSTEM and GAS BOOSTER STATION

(Located in West Beaumont, Texas, Field)

. . . gathers gas that was formerly "flared"; then compresses and delivers it at 450# pressure to commercial gas lines. All operations are automatically controlled and require the supervision of only one attendant.

In addition to the building, cooling tower, scrubbers and compressor equipment shown, this installation includes a 6-mile gathering line system consisting of pipe sizes from 2" to 8", as well as a residence on the lease for the supervisor.

It was designed and constructed by Deerfield Petroleums, Inc. and is being operated by Universoil, Inc. All equipment and material was supplied by "Oilwell" . . . enabling the contractor as well as the operator to centralize procurement details at a single convenient source.

Discover for yourself...

. . . the many advantages of shifting procurement responsibilities to a long-established, fully-integrated company, specializing in supplies for the petroleum industry. The next time you undertake a development project of this type . . . bring your problem to "Oilwell."

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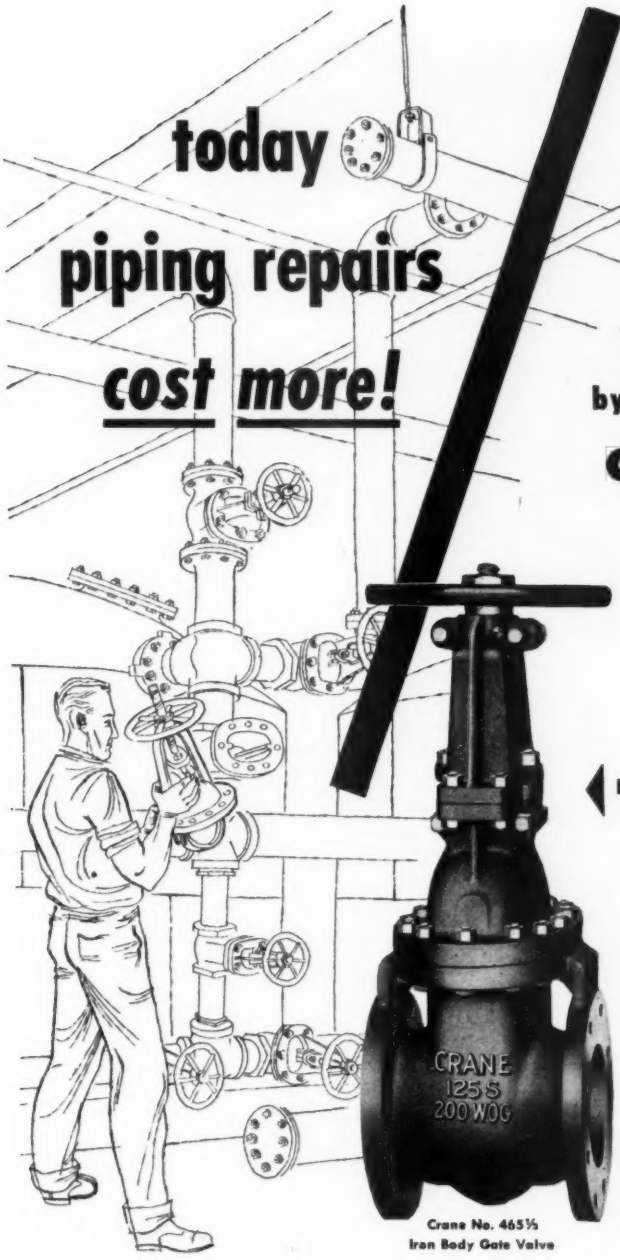
USS

"OILWELL"

TRADE MARK

UNITED STATES STEEL

today piping repairs cost more!



Crane No. 465½
Iron Body Gate Valve

You make fewer of them

by using Dependable Quality

CRANE VALVES

...That's why more Crane Valves are used than any other make

No bonnet joint trouble with this valve

A typical example of low-cost maintenance—Crane No. 465½ 125-Pound Iron Body Gates. Rarely does the bonnet joint need attention. Flange construction includes reinforcement to prevent distortion and utilizes more bolts, more closely spaced, than is usual in valves of this class. Crane precision-guided seating reduces seat and disc wear. Packing has long life because these valves have a deep stuffing box filled with high grade asbestos ring packing. A ball-type gland helps to equalize the packing load.

Better performance features like these make Crane the better buy in valves of every type. They assure low maintenance cost—low ultimate valve cost—for every piping service.

CRANE CO.

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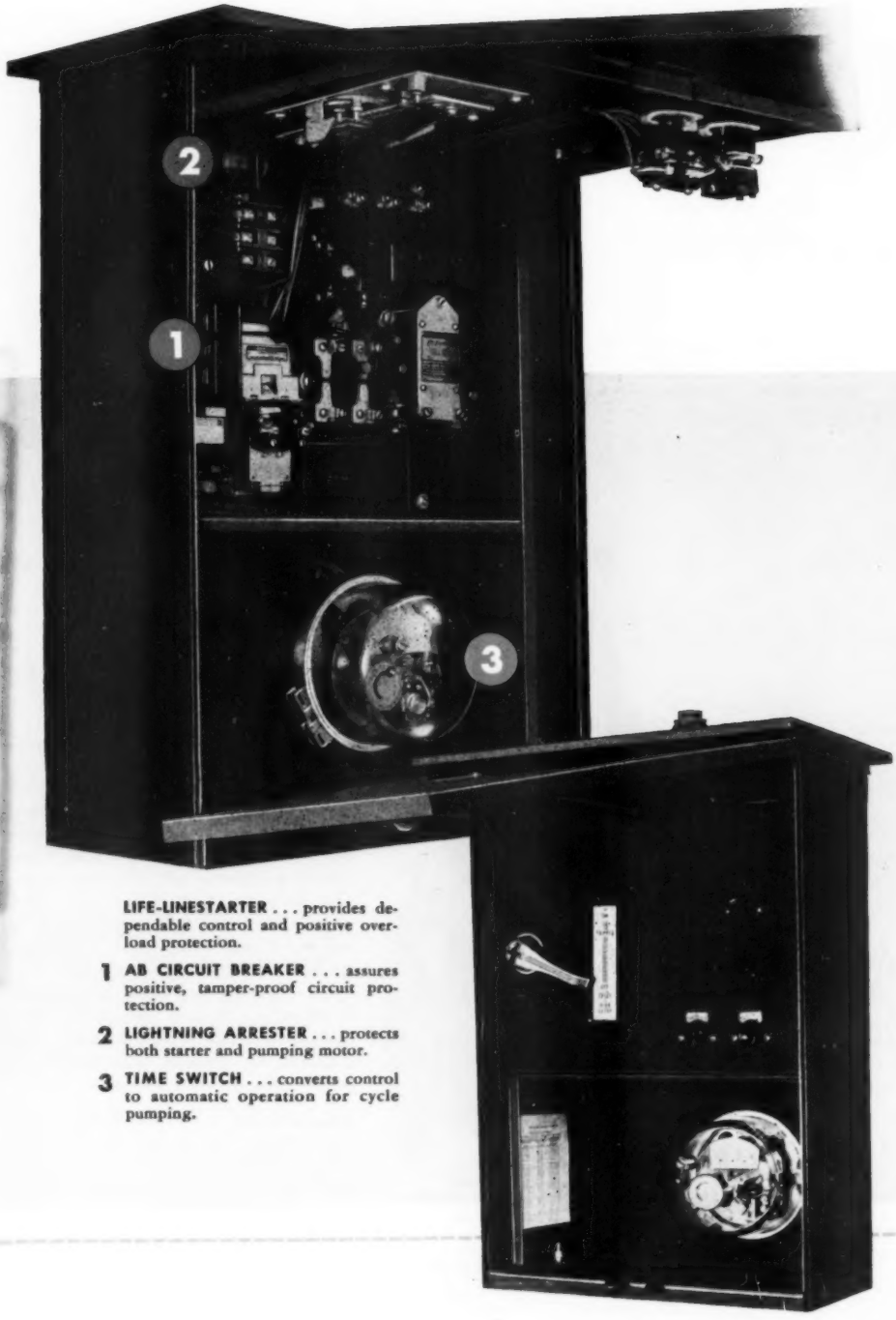
VALVES • FITTINGS • PIPE • PLUMBING • HEATING



LIFE-LINESTARTER . . . provides dependable control and positive overload protection.

1 **AB CIRCUIT BREAKER** . . . assures positive, tamper-proof circuit protection.

2 **LIGHTNING ARRESTER** . . . protects both starter and pumping motor.

3 **TIME SWITCH** . . . converts control to automatic operation for cycle pumping.

Proper Control...

key to improved pumping efficiency

The cost of operating your oil wells is in the hands of your pumping motor controls. Properly designed controls can cut: maintenance time, unnecessary idle time, down time due to equipment failure . . . can increase dollar return.

Take cycle pumping for instance. The time switch on a Westinghouse Oil Field Pumping Control handles this operation automatically. This switch provides for one or more periods of pumping, with intervening periods of shutdown during a 24-hour period. It also provides for one or more full days of shutdown during a week, which may be grouped or spaced throughout the week as desired.

Then there's protection. To be good it must be complete. You get three-way protection with this Westinghouse Pumping Control . . . protection against overloads, faults, lightning. The Life-Linestarter* with its simplified design provides positive overload protection through its snap-action, bimetallic disc-type overload relay. Westinghouse AB Circuit Breaker takes care of fault protection . . . has an interrupting capacity of 15,000 amperes at 600 volts . . . eliminates single phasing replacement and maintenance problems common to fuses. Built-in lightning arrester dissipates lightning surges and static charges . . . protects both the starter and pumping motor.

Every component of this Westinghouse Pumping Control aids in improving the efficiency of your oil well pumping. Compare them yourself.

Get the complete story. Ask for a copy of Westinghouse Electrified Oil Well Pumping, B-4039. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-21649

YOU CAN BE SURE.. IF IT'S

Westinghouse

Life-Line

MOTORS and CONTROLS

New Answers . . . to Present pH Problems

New Immersion Electrode Assembly uses no sampling line.

New lightweight Flow Electrode Assembly for sampling line measurements.

Two families of controllers for pH applications.

"Controllability Analysis" form for engineering data.

With brand-new developments in pH equipment, plus 26 years experience in pH instrumentation, L&N now has new answers to several important types of industrial pH problems. Furthermore, a unique, time-saving "Controllability Analysis" service quickly and accurately points to the control system which will solve the specific problem.

New developments in equipment cover both the electrodes which sense changes in the pH, and the housings or assemblies which hold the electrodes.

Entirely waterproof construction is featured in the new electrodes. It makes them ideal for humid or wet locations, since they are fully immune to electrical leakage as well as to penetration by process liquids.

One of the new assemblies is an immersion-type unit, to operate in tanks, reactors, etc.; it can even be totally submerged if necessary. It also operates in many places which formerly required a flow-type unit; in such cases it eliminates both the installation and the maintenance of sampling line, pump and accessories. It is made of light, corrosion-resistant plastic.

The other new electrode assembly features convenience and stability where a flow-type unit must be used. Made of plastic, it is light, small, easy to install and thoroughly dependable. Where plastic might not suit, we of course continue to supply assemblies of cast iron and/or Pyrex brand glass.

Two families of recording and controlling instruments are now available: the familiar, accurate and reliable Micromax and the newer but equally dependable Speedomax continuous-balance instrument. Both are available with either electrical or air actuated control systems.

For application engineering simply fill in one of our "Controllability Analysis" forms. Our engineers can then tell how closely pH can be held with either present or proposed plant layout. Let's get together on that pH problem! You will not be obligated: simply write to Leeds & Northrup Co., 4959 Stenton Avenue, Philadelphia 44, Pennsylvania.

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

LEEDS & NORTHRUP CO.

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ASK THESE 10 QUESTIONS
before you buy a diesel engine!

1 Is it a "true" diesel?

2 Does it have unit fuel injection?

3 Does it have four valves per cylinder?

4 Does it have distortionless pistons?

5 Does it have interlocking rods?

6 Does it have an extra heavy crankshaft?

7 Does it have dual overhead camshafts?

8 Are the camshafts driven from the flywheel end?

9 Does it have an integral hydraulic servo-type governor?

10 Is the cylinder block symmetrical?

ASK these questions of any diesel engine salesman and you'll find that only the Murphy Diesel Salesman can answer "Yes" to all of them. From an operating standpoint ten "Yeses" mean you'll get more power, greater economy, greater dependability and longer engine life . . . just what you get with Murphy Diesels. Full information is given in the booklet *"10 Questions to Ask a Diesel Engine Salesman."* Ask your Murphy Diesel Dealer for a copy or write direct.

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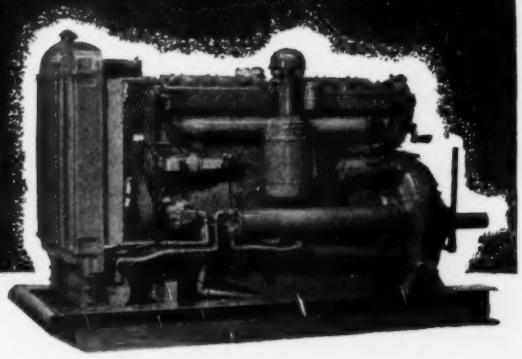
Heavy duty power
for the oilfields

Murphy Diesel Engines and Power Units for drilling and pipe line pumping, 90 to 226 H.P., 1200 and 1400 RPM. Generator Sets, 60 to 140 K.W. Dual-Fuel Engines, 135 to 180 H.P. Also Crude Oil Burning Engines.



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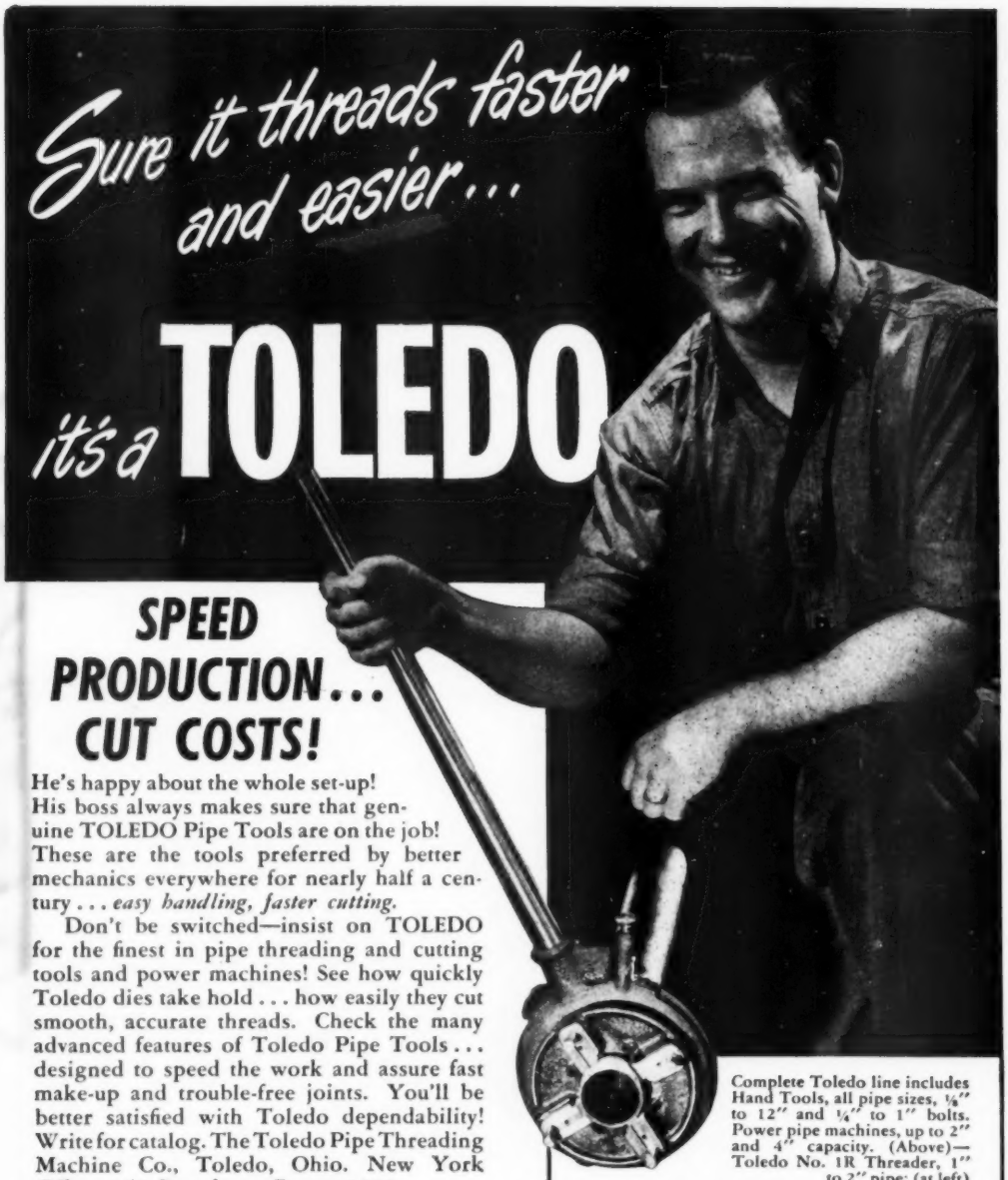
OIL INDUSTRY FACTORY BRANCH—Sales, Parts and Service:
113-117 South Elwood Street, Tulsa, Oklahoma

Sure it threads faster and easier...

it's a TOLEDO

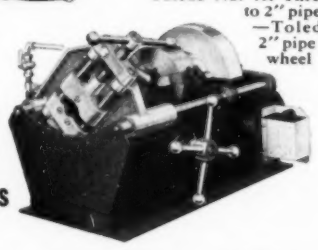


SPEED PRODUCTION... CUT COSTS!

He's happy about the whole set-up! His boss always makes sure that genuine TOLEDO Pipe Tools are on the job! These are the tools preferred by better mechanics everywhere for nearly half a century . . . *easy handling, faster cutting.*

Don't be switched—insist on TOLEDO for the finest in pipe threading and cutting tools and power machines! See how quickly Toledo dies take hold . . . how easily they cut smooth, accurate threads. Check the many advanced features of Toledo Pipe Tools . . . designed to speed the work and assure fast make-up and trouble-free joints. You'll be better satisfied with Toledo dependability! Write for catalog. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

Complete Toledo line includes Hand Tools, all pipe sizes, ⅛" to 12" and ¼" to 1" bolts. Power pipe machines, up to 2" and 4" capacity. (Above)—Toledo No. 1R Threader, 1" to 2" pipe; (at left) —Toledo #999 2" pipe machine, wheel or knife cut-off.



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PIPE TOOLS . . . POWER PIPE MACHINES . . . POWER DRIVES

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HERE ARE 10 REASONS WHY...

1 Products and procedures available for every oil and gas pipeline requirement.
2 Withstand extremely high and low temperatures.
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8 Used by thousands of engineers and contractors.
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10 Barrett engineering service always available.

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*Reg. U. S. Pat. Off.

"STEAM-EX" Saves 7 Ways

- ✓ Cuts in half time required to gas free storage tanks. "Steam-Ex" can exhaust about 300,000 cubic feet of air per hour.
- ✓ Readily portable. "Steam-Ex" is made in three easy to handle sections. It can be mounted on the manhole flange, assembled and put into operation faster than any other gas freeing system.
- ✓ One man can carry, assemble and operate "Steam-Ex."
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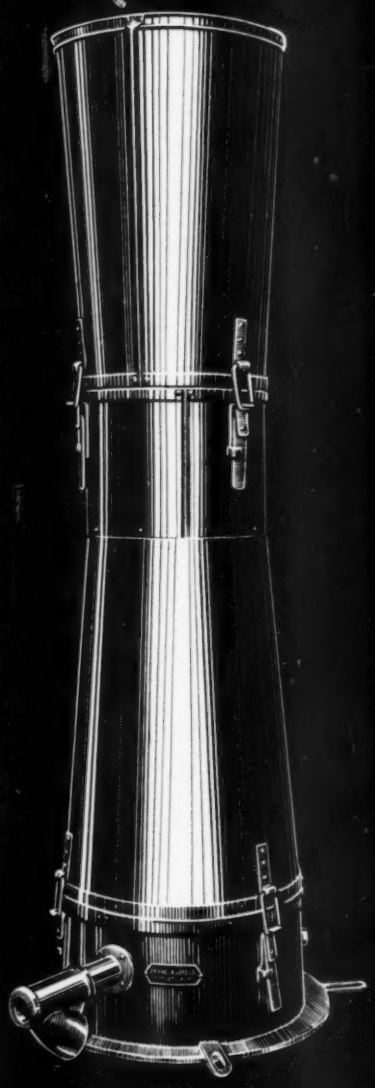
- ✓ Requires less steam or air to gas free any given tank.
- ✓ One size fits all manhole flanges from 18" to 24" I.D., and from 24" to 30" O.D. inclusive.
- ✓ Long life of trouble free performance. The "Steam-Ex" housing is constructed of heavy guage black iron, and the nozzle is of all bronze. "Steam-Ex" has no moving parts . . . no maintenance problems. "Steam-Ex" is SAFE.



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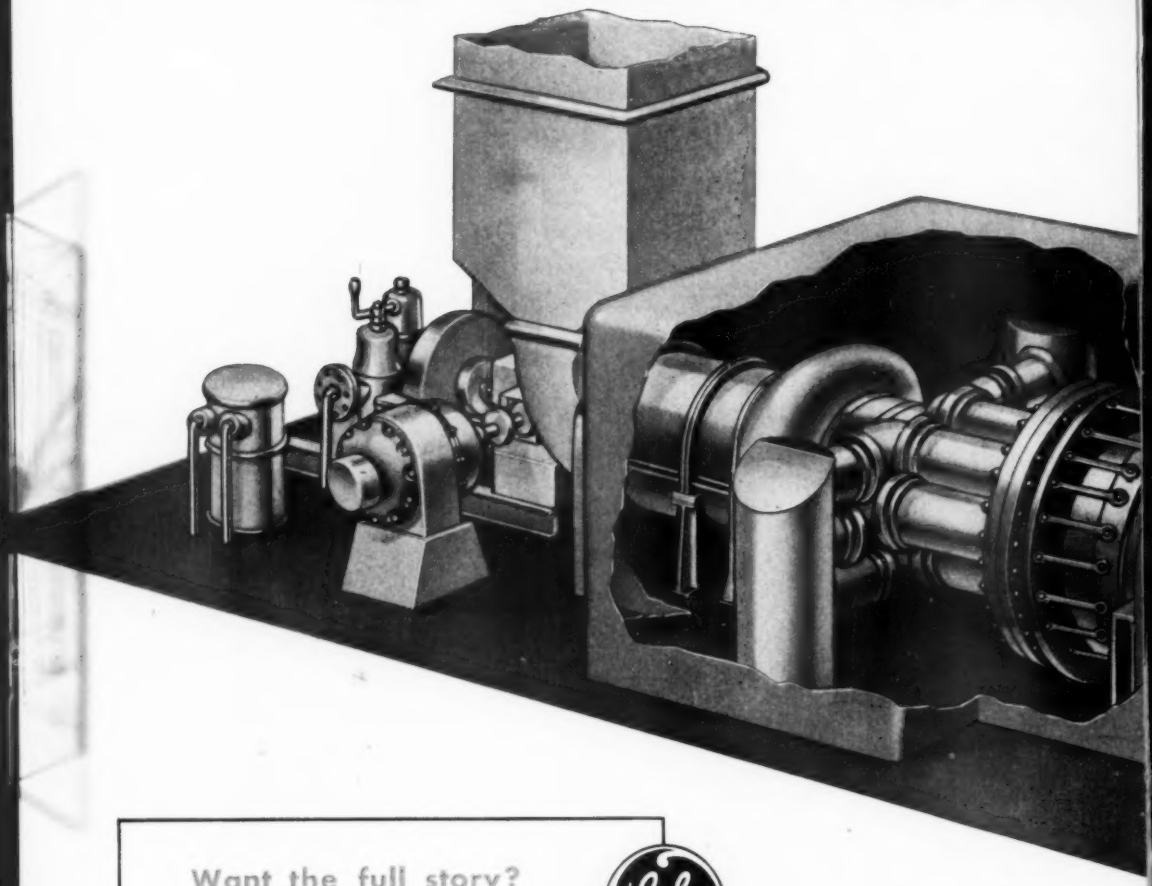
ANNOUNCING the G-E
specially designed



Want the full story?

Just off the press is a new booklet describing in detail the features and advantages of this great new G-E combustion gas turbine specially designed for gas pipeline pumping. Write now to Section 661-28 for your copy of Bulletin GEA-5530.

COMBUSTION
GAS TURBINE
FOR GAS PIPELINE PUMPING

—backed by 45 years of turbine leadership!

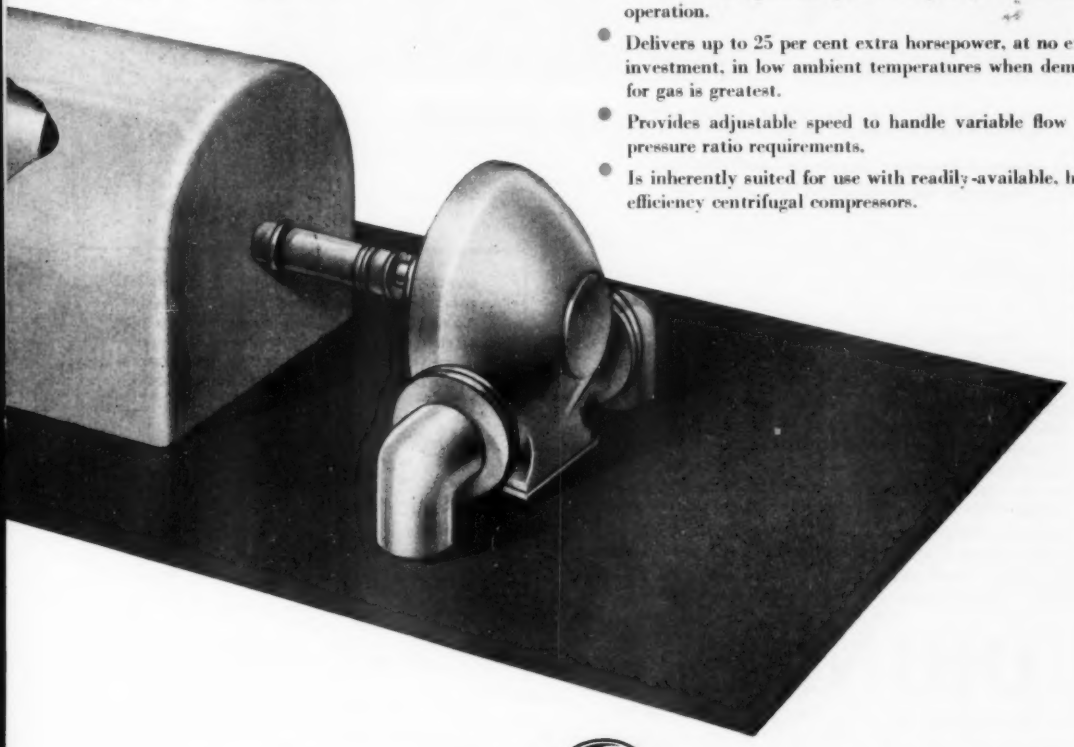
combustion GAS TURBINE
for gas pipeline pumping

Now—a complete, practical and reliable G-E prime mover for direct connection to high-efficiency centrifugal compressors—to help you cut gas pipeline pumping costs!

Behind the development of this gas turbine is the engineering, the experience, and the resources of General Electric—your assurance of reliability in operation. Ask your G-E representative to discuss the application of the G-E gas-pipeline gas turbine to *your* operation. *General Electric Company, Schenectady 5, N. Y.*

Here's the story in brief!

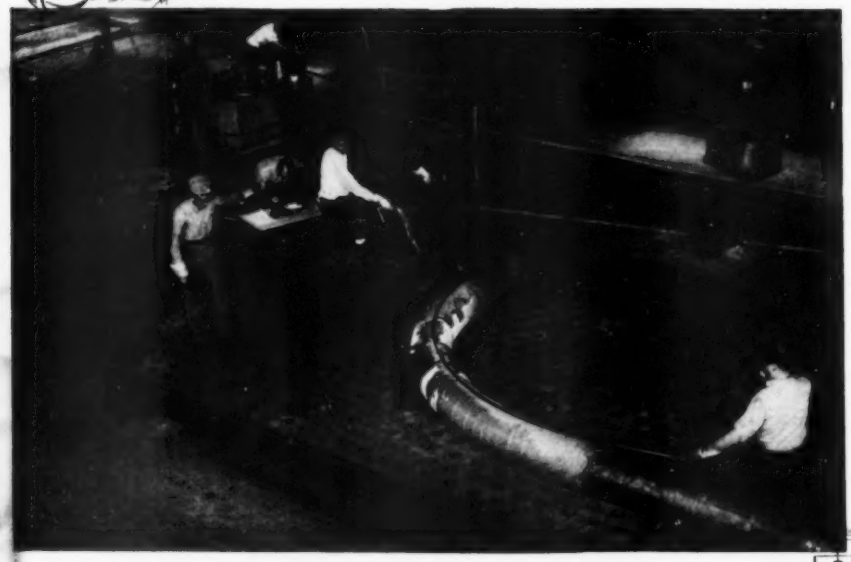
- Rated 5000 hp, 5000 rpm, at 1000-foot altitude and 80 F ambient temperature.
- Permits simplified station layout and relatively small buildings to cut construction costs.
- Requires little or no make-up water, an important factor especially in desert country.
- Is entirely self-sustaining, using gas from the line as fuel.
- Readily lends itself to remote supervisory control, because it is self-protecting and completely automatic in operation.
- Delivers up to 25 per cent extra horsepower, at no extra investment, in low ambient temperatures when demand for gas is greatest.
- Provides adjustable speed to handle variable flow and pressure ratio requirements.
- Is inherently suited for use with readily-available, high-efficiency centrifugal compressors.



GENERAL ELECTRIC

661-28

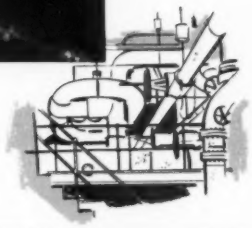
From interpretation to installation . . .



GRINNELL PREFABRICATED PIPING

assures greater customer satisfaction through its five-point program of

Quality Control



The bending operation illustrated above is an example of Grinnell QUALITY CONTROL *in action . . .*

The tubing shown is made from a chromium alloy steel forging, turned and bored. Outside diameter is 14¾ inches; wall thickness 2⅜ inches. Temperatures of the tubing within the bending furnace were maintained and controlled within 20°F of specified temperatures. Bending was done with such skill and rapidity as to permit a temperature drop of only 100°F at the inside surface of the tubing. Maximum thinning was only .06 inch.

Designed for a central station power plant to accommodate 1500 PSI and 1050°F, this is typical of Grinnell's engineering knowledge which assures prefabricated piping of the right kind — for all types of installations no matter how complex.

QUALITY CONTROL is the result of Grinnell's 100 years of practical experience in the field of piping. Delivery of prefabricated piping subassemblies to exacting engineering requirements which meet all governing code requirements is assured by Grinnell Quality Control, which includes:

- Interpretative engineering
- Metallurgical research
- Specialized facilities
- Skilled personnel
- Rigid inspection

ECONOMY of specifying Grinnell prefabricating piping results from:

- One source for design, interpretation and fabrication
- Coordination of shop production under ideal conditions
- Elimination of waste by paying only for finished material delivered
- Reduction in field erection time

Write for the booklet, Grinnell Prefabricated Piping.

GRINNELL

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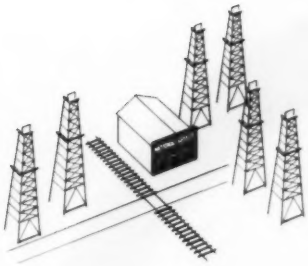
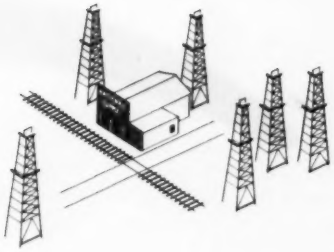
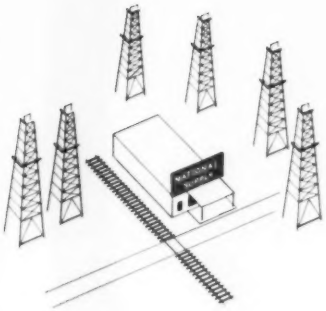




CROSSROAD STORES

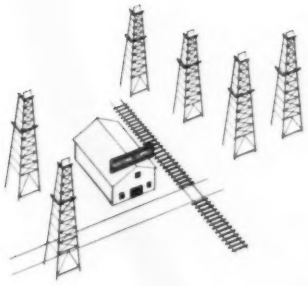
ON OIL COUNTRY MAPS



You don't need a special map to locate National Supply stores. Your oil country maps are good enough because you'll find these familiar crossroad stores with the National Blue sign, wherever rotaries are turning or wells are on the pump.

That's why it's good business to deal at National Supply —you're always close to a complete stock of equipment and operating supplies for drilling or production.

There are hundreds of items you'll need from flashlight batteries to complete rigs. And they bear well-known names, National, Ideal, Superior, Atlas, Spang—the equipment and related products you've found in oil fields throughout the world.



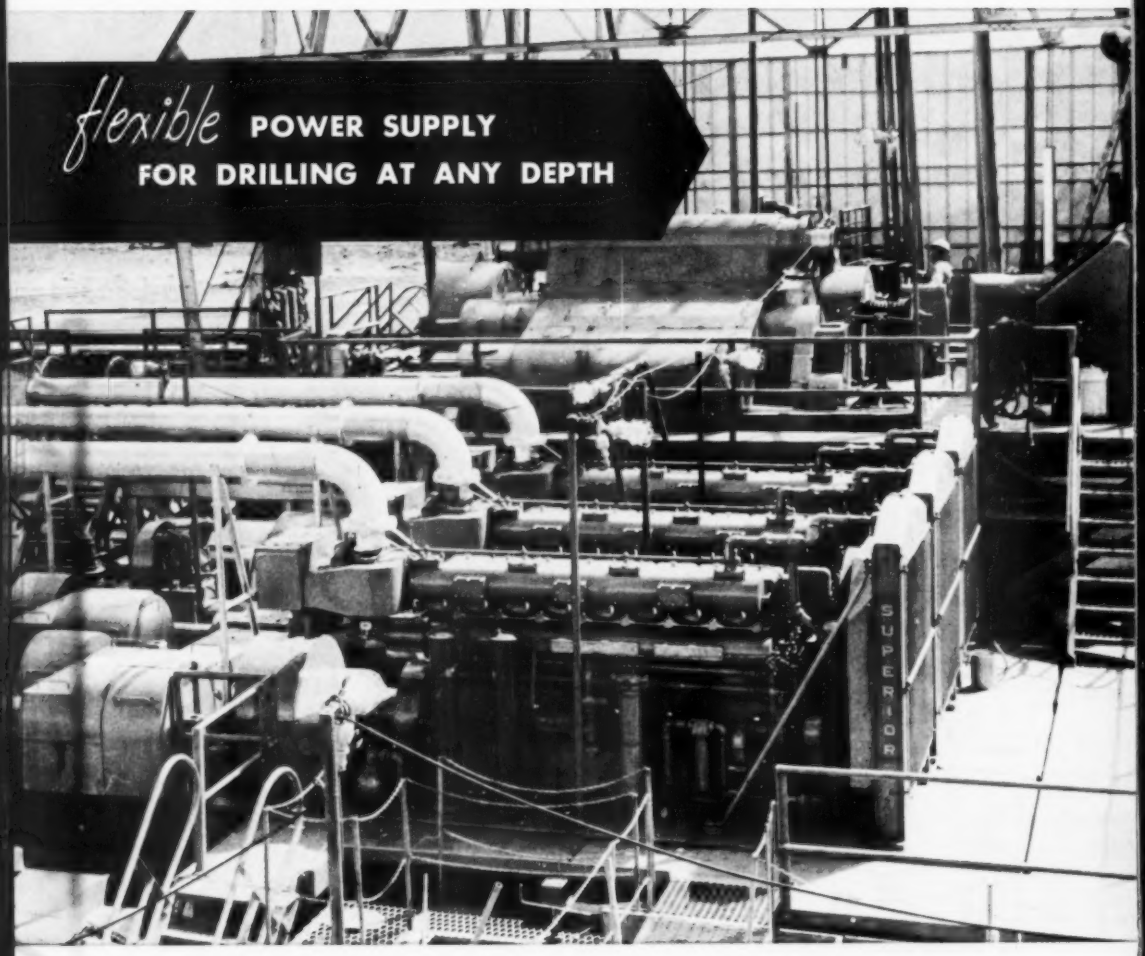
At each store there are experienced oil country men always on the job to help you select and get maximum service from your National Blue equipment.

You'll find everything that's standard and everything that's new in oil field drilling and production equipment at these crossroad stores—drop in and bring yourself up to date on what's happening at National Supply.

THE NATIONAL SUPPLY COMPANY

GENERAL SALES OFFICES: TOLEDO, OHIO

NATIONAL BLUE PRODUCTS


flexible POWER SUPPLY
FOR DRILLING AT ANY DEPTH
SUPERIOR

SUPERIOR TYPE PTD DIESEL

DRILLING ENGINES

THE EXPERIENCE of National Supply in producing oil drilling equipment, and of Superior in the manufacture of engines, were combined in the development of Superior Type PTD Diesel Drilling Engines.

Employing the efficient 4-cycle principle, and incorporating construction features especially designed for the exacting and varied requirements of all drilling operations, Superior Type PTD Drilling Engines have passed every test in actual service.

Built in 6 and 8 cylinder models, both naturally aspirated and supercharged, Superior PTD's are conservatively rated from 280 to 670 horsepower. When compounded in a drive group they will furnish abundant power for operating rotary, draw works and pumps even at the maximum depth now being drilled.

For operation on oil and natural gas a dual-fuel attachment is available as original equipment or for installation after the engine is in service. The dual-fuel feature provides rapid change-over to take advantage of fuel availability and economy.

The horsepower ratings of Superior Diesel Drilling Engines are the same whether operating on oil or gas. Performance charts for each size will be found in bulletins you can obtain from a nearby National Supply store.

THE **NATIONAL SUPPLY** COMPANY

GENERAL SALES OFFICES: TOLEDO, OHIO

DIVISION OFFICES: Casper; Ft. Worth; Pittsburgh; Tulsa; Torrance

CANADA: The National Supply Company, Limited, Room 202, Alberta Block, Calgary, Alberta

EXPORT: National Supply Export Corporation, 600 Fifth Avenue, New York 20, N.Y., U.S.A.; River Plate House, 12 South Place, London E.C. 2

NATIONAL OIL FIELD MACHINERY AND EQUIPMENT · SPANG STEEL PIPE · SUPERIOR & ATLAS ENGINES

you have

DOUBLE PROTECTION WITH SPANG DOUBLE SEAL SHRINK THREAD DRILL PIPE AND TOOL JOINTS

you can

REPLACE TOOL JOINTS RIGHT AT YOUR RIG

Spang Double Seal Shrink Thread Drill Pipe and Tool Joints are engineered for maximum service, and to minimize costly shut-down time.

The threads function only to join sections in the Spang Double Seal Shrink Thread connection. Careful machining of inner and outer seals provides the necessary sealing action. The full circumferential mating surfaces form external and internal seals which stop washouts and prevent entry of fluids into the threads.

Spang Double Seal Shrink Thread Tool Joints are easy to replace at your rig, reducing shut-down time and minimizing trucking expense.

Ask for your copy of our bulletin, "Spang Double Seal Shrink Thread Drill Pipe and Tool Joints."

GENERAL SALES OFFICES: Pittsburgh, Pa.
DIVISION OFFICES: CASPER; FT. WORTH; PITTSBURGH; TULSA; TORRANCE
CANADA: THE NATIONAL SUPPLY COMPANY, LIMITED, ROOM 202, ALBERTA BLOCK, CALGARY, ALBERTA
EXPORT: NATIONAL SUPPLY EXPORT CORPORATION, 600 FIFTH AVE., NEW YORK 20, N.Y., U.S.A.; RIVER PLATE HOUSE, 12 SOUTH PLACE, LONDON E.C. 2

THE NATIONAL SUPPLY COMPANY
SPANG-CHALFANT DIVISION

NATIONAL BLUE PRODUCTS

NATIONAL OIL FIELD MACHINERY AND EQUIPMENT • SPANG STEEL PIPE • SUPERIOR & ATLAS ENGINES

2 READINGS OF A 40 SECOND INTERVAL

Only DRIFT INDICATOR WITH THIS FEATURE

Eastman

NEW MECHANICAL SELF CHECKING DRIFT INDICATOR

Yes, there are other drift indicators. But Eastman, and only Eastman, has the 40-second interval self-checking feature.

No batteries, light bulbs or photo-sensitive discs are used. This drift indicator's operation is COMPLETELY MECHANICAL.

Simple to operate — accurate in its recordings — rugged in construction.

The instrument can be go-deviled or lowered into the hole on any conventional line.

Operators may contract for this instrument on a daily or term rental basis at a nominal charge. Call the nearest Eastman office for details and a demonstration.

22 offices for your convenience — Consult your telephone directory.

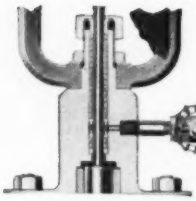
EASTMAN OIL WELL SURVEY COMPANY

LONG BEACH • DENVER • HOUSTON

* COMPARE

THIS FEATURE

OF THE HONEYWELL SERIES "700" VALVE



ONE-PIECE BONNET

One-Piece Bolted Bonnet of forged steel provides greater ruggedness, simplifies removal for maintenance. Stuffing box is an integral part of bonnet, depth at least six times diameter of stem. Lantern Gland is double packed (top and bottom) . . . added protection against leakage.

Specially Designed Neoprene Diaphragm

Duplex Upper Stem Guide

Packless Bellows Seal

Safety Stem Lubricator

Wide Variety of Discs

Reversibility in the Field

* Compare the bonnet of this valve with that of any other wide band proportional type. Look at it closely . . . study it feature by feature.

Then check the other features of the valve . . . the Specially Designed Diaphragm, the Duplex Stem Guide, the Packless Bellows Seal, the Safety Stem Lubricator, the wide variety of discs, the easy reversibility in the field.

Your comparison will prove that the Honeywell Series 700 has *all* the features you look for in a fine valve.

It's available in a wide range of styles and sizes. For detailed information, write for a copy of Catalog 700-2, or call in your local Honeywell engineer . . . he is as near as your phone..

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 1906 Windrim Ave., Philadelphia 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.

New Bulletin 750, "Control Valve Sizing Data," is now available

MINNEAPOLIS **Honeywell**

VALVE PRODUCTS

Tuffy ROTARY LINES

...Make Any Good Rig BETTER!

Wherever you go in the oil fields, you'll find that the drillers who get the most out of their rigs are the drillers who depend on TUFFY Rotary Lines.

TUFFY Rotary Lines are made with special steels and employ a unique construction that give them extra resistance to shock loads, crushing on drums and internal friction. That's why TUFFY Lines give you more round trips under all conditions.

DRILLERS! Send for this Ton-Mile Indicator

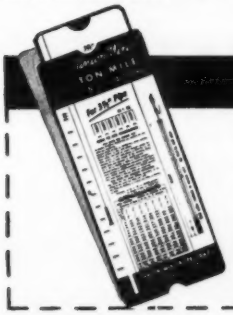
Union Engineers have developed this easy-to-use tool to help you measure the amount of work your rotary line has done. It helps you establish the proper time for cutting off. No complicated figuring with this Ton-Mile Indicator. It does all the work. With it you get a Union Log Book to help you keep well records. Mail the coupon for yours—*today!*

TUFFY Standard Rotary Line

Designed for use on standard rigs and recommended for jackknife rigs when drilling deep.

TUFFY Jackknife Rotary Line

Spools and reeves easier at high speeds over the smaller drums of the jackknife rig.



union Wire Rope corporation

EASY TO ORDER

Just specify the type of TUFFY Rotary Line you need—Standard or Jackknife—the length of line and the size. That's all. No complicated ordering symbols. It's easy.

2102 Manchester Ave., Kansas City 3, Mo.

Gentlemen: Please Have Your Fieldman Deliver My Union Ton-Mile Indicator and New Log Book and Show Me How Easy It Is To Use.

NAME_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

The renewable resilient seat of the Cameron Flex-Seal Mud Line Valve distinguishes it from conventional valves having a metal-to-metal seat. The resilient seat absorbs, slowly and evenly, the cutting action of the mud, and, when finally worn out after long service, may be easily replaced at the rig for only a few dollars. It is made of the toughest oil- and acid-resistant rubber and has been known to outlast ordinary steel valve seats ten to one. Its resiliency insures a pressure-tight seal despite trash on the seat. Should the gate become sand cut, the rubber seat flows into the irregularities to effect a positive shut-off.

The Cameron Flex-Seal Mud Line Valve is the only valve designed especially for abrasive service. Test it with any other valve and note its longer service life and lower maintenance.

CAMERON IRON WORKS, INC.
P. O. Box 1212, Houston, Texas
Export: 74 Trinity Place, New York, N. Y.
Represented in the sterling area by: British Oil Field Equipment Co., Ltd., London, S.W.1

only

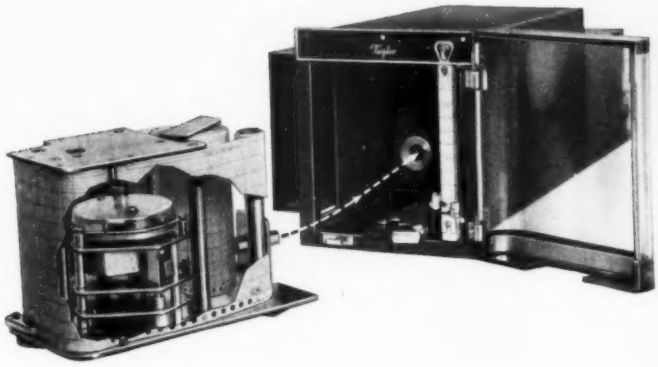
Cameron

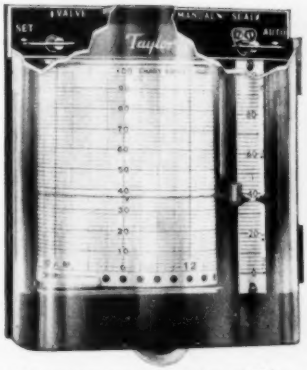
FLEX-SEAL
mud line valves

provide this long life, low maintenance feature

PNEUMATIC CHART DRIVE FOR HAZARDOUS ATMOSPHERES

on Taylor's TRANSET Recorder*





A 3-hour continuous record is visible on this thirty-day rectilinear strip chart. This TRANSET Recorder fits 4⅜" x 5" panel space, with automatic-manual unit, remote set point adjustment, valve position indicator—all with unmatched accuracy and dependability.

Another Taylor Hit! The air driven chart drive mechanism for the popular TRANSET RECORDER makes all the advantages of the recorder available to installations in hazardous atmospheres. No electrical connections. The air jet turbine is geared to a self-starting escapement. The pneumatic chart drive is precision-built to give performance that equals or betters spring actuated clock mechanisms.

Accurate, Trouble-free performance is assured because the escapement mechanism is sealed in a rugged, air-tight, rust-proof housing mounted above the air jet out of the air stream.

Low Air Consumption! Only .08 scfm at 20 psi. Operates accurately even though air supply fluctuates within 15 and 35 psi.

Minor timing adjustments can be made externally, and the whole unit may be removed from the chart assembly by removing just three screws. Self-sealing air connection shuts off air supply automatically when chart drive is removed.

For Complete Details, send for Bulletin 98097-A.

Taylor Instrument Companies, Rochester, N.Y., and Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

Taylors Centennial ACCURACY FIRST SINCE 1851

*Trade-Mark

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

What a Record!

MORE THAN TWO YEARS WITHOUT A "TURNAROUND"!

That's the outstanding initial performance record of this "cat cracker" at the Cities Service Oil Company's refinery, East Chicago, Indiana. Here Consolidated Safety Relief Valves again proved their absolute protection against overpressures in processing equipment.

Leakage under discharge piping stresses is eliminated because of the outside bevel seat and floating guide construction of these valves. The method of establishing the outside bevel seat permits the disc to be moved on a radial seating surface. Complete tightness is assured in all positions within the deflection range, under all conditions of service.

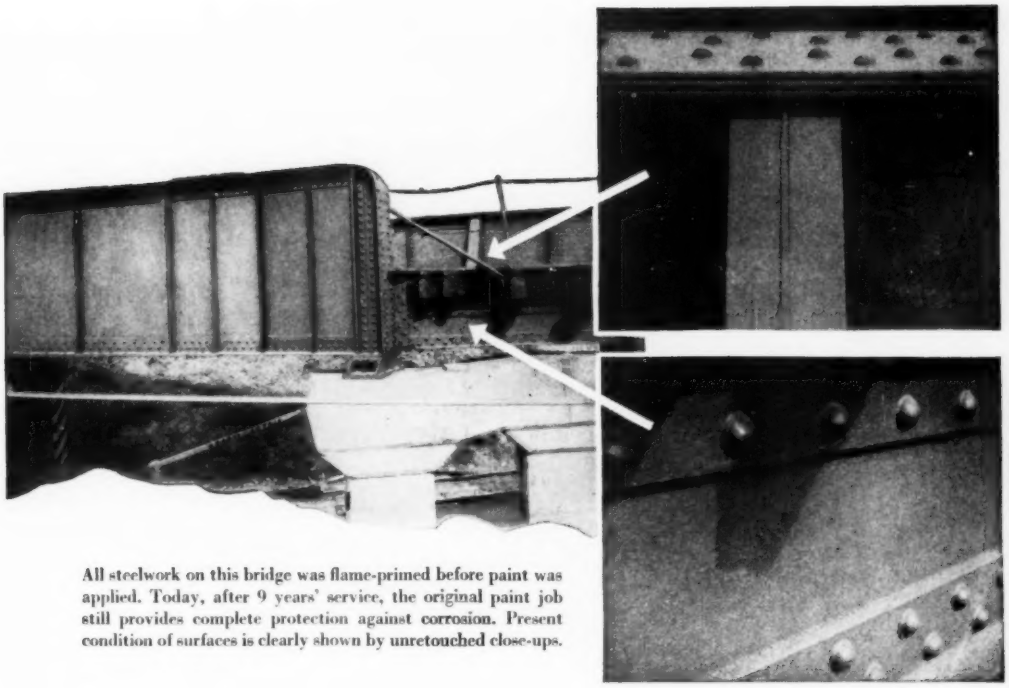
Designed with 25% fewer parts, Consolidated Safety Relief Valves simplify servicing, minimize standardization problems, reduce maintenance costs. Working parts cannot become misaligned — continuous performance is assured at the rated capacity.

Growing defense and civilian needs are crowding refinery capacity. So—depend on Consolidated Safety Relief Valves to help you stretch the time between turnarounds. There's no better valve investment to safeguard life, property and continuous production. Your local distributor will gladly tell you all about these economical, long-life safety relief valves.

CONSOLIDATED SAFETY RELIEF VALVES

A product of **MANNING, MAXWELL & MOORE, INC.** TULSA, OKLAHOMA

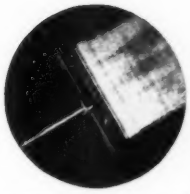
MAKERS OF 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN' ELECTRICAL AND INDUSTRIAL INSTRUMENTS, 'HANCOCK' VALVES, 'ASHCROFT' GAUGES. BUILDERS OF "SHAW-BOX" CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.



All steelwork on this bridge was flame-primed before paint was applied. Today, after 9 years' service, the original paint job still provides complete protection against corrosion. Present condition of surfaces is clearly shown by unretouched close-ups.

Your Steelwork . . .

How Will It Look in 1960?



Steelwork you coat with good paint today can still look like new ten years from now, *if you flame-prime all exposed surfaces first.* And what you'll save on maintenance, because of increased protection due to flame-priming, will more than pay for all the flame-priming apparatus and materials you need for the job.

Flame-priming is simple to do, requires little equipment, and costs little. A brush of oxy-acetylene flames pops off scale and drives out moisture. Paint applied to the warm, dry surface goes on quickly and smoothly, bonds tightly, and lasts longer.

Flame-priming is one of many time- and money-saving LINDE methods for making, cutting, joining, treating, and forming metals. So, whatever you do with metals, there is a good chance that LINDE know-how, show-how, and equipment can help you do it better, more quickly, or at lower cost.

To find out, without obligation, telephone or write our nearest office today. LINDE AIR PRODUCTS COMPANY, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in Other Principal Cities. In Canada: Dominion Oxygen Company, Limited, Toronto.

Linde Trade-Mark

Products and Processes for MAKING, CUTTING, JOINING, TREATING, AND FORMING METALS

The term "Linde" is a registered trade-mark of Union Carbide and Carbon Corporation.

Sensational Performance

and unbeatable safety records!

In Two Great New U. S. RUBBER Rotary Hose

U. S. ROYAL 4 —first rotary hose ever to offer these great advantages—

Double Reinforcing Wire Units —Royal 4 incorporates 2 double wire layers (4 stress wires in all) to a unit—each layer a hose in itself with sufficient hydrostatic value to resist bursting.

Highest Working Pressure —rules out the "burst" risk taken when conventional hose operates on the modern high-pressure pumps of today . . . eliminates costly switching to steel hose when high pump pressures are required.

Ultra-Flexibility —subjected to torturous factory "sling" tests, Royal 4—due to its special wire-reinforced, fabric-and-rubber construction—has demonstrated a degree of flexibility unparalleled in rotary hose history.

Complete Kink Resistance —with extreme flexibility from leakproof coupling to leakproof coupling, Royal 4 resists all forms of kinking even on mast type rigs.

Record Trouble-Free Test Performances —after two long and rigorous test years in the deepest fields of Texas, Louisiana and Oklahoma...under the highest pressures of off-shore Gulf Coast drilling...U.S. Royal 4—in varying service lengths fitted to every type of rig—has come through without a failure.

U. S. MATCHLESS CABLE-LAY —new and vastly improved with qualities no other Cable-Reinforcing hose possesses—

Twist-Free Cable Construction —its 19-strand cable wire of highest tensile steel is so arranged as to completely eliminate the characteristic twisting of cable wire under stress.

Unique Failure-Proof Carcass —a special, soft, pliable yet super-strong cotton fabric overcomes the incidence of carcass failure so frequent in most flexible hose.

Complete Kink Resistance —Like U. S. Royal 4, ultra-flexible U. S. Matchless Cable-Lay with its built-in, leakproof couplings makes for a super-effective kink-resistant working length.

Extended Flex Life —with its special long-lasting carcass and twist-free cable strands in rubber-cushioned plies, U.S. Matchless Cable-Lay guarantees an appreciably longer flex life.

Product of Exhaustive Experimentation —thousands of tests involving wire sizes, strand numbers and degrees of flexibility preceded the making of U. S. Matchless Cable-Lay. Now—in answer to oilmen's demands for a better Cable-Reinforced hose—it is ready to add miles of drilled footage to service life.

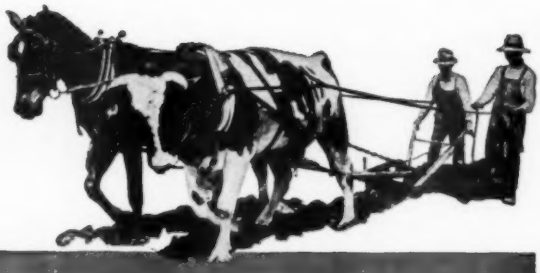
Expert advice and service on the job are yours for the asking. See your "U. S." Distributor about these great new hose or write...

PRODUCTS OF U.S.RUBBER SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • Rockefeller Center, New York 20, N. Y.

Man Hour vs. Machine Power



Petroleum Research has helped revolutionize Agriculture

A modern tractor and its associated equipment now save about 850 hours of man labor annually, compared with the time required with the animal power and equipment used a generation ago.
—*U. S. Department of Agriculture*

Steam power and wheels of steel were the first clumsy steps towards today's modern tractor. In just the past ten fast-moving years the number of tractors on farms has jumped from 1,700,000 to 3,800,000. And—throughout the U. S.—Texaco plays a familiar and integral part in this farm progress—providing fuels and lubricants for tractors and other vital equipment.

ALTHOUGH the farmer must still apply his time, as in all things, far less of his time and physical labor accomplishes much more. For instance—a 20 bushel/acre wheat crop that required over 50 man-hours a century ago can be produced now with about 3 man-hours!

Petroleum research and development helped bring about the revolution in farm mechanization, with gasoline and Diesel-powered engines harnessed to farm equipment. Today our farmers employ some 178-million horsepower—more than is used in all America's factories.

This is indeed one of petroleum's greatest contributions to the needs of a nation and the world. It is also a striking example of free men at work in a healthy spirit of free competition.

THE TEXAS COMPANY

Petroleum Promotes Progress

TEXACO

Steel Scrap is Very Scarce!

You have given your sons to the Armed Forces

You have devoted your plants to the defense effort

You have joined Civilian Defense

You have bought Defense Bonds...given your blood

***Now*...will you turn in your scrap?**

Without vital scrap, the steel so desperately needed cannot be made.

Round up your scrap—call in your scrap dealer *TODAY!*

The Colorado Fuel and Iron Corporation

CF&I

AMERICAN WIRE FABRICS CORPORATION, Mt. Wolf, Pa.
CLAYMONT STEEL CORPORATION, Claymont, Del.
THE CALIFORNIA WIRE CLOTH CORPORATION, Oakland, Calif.
WICKWIRE SPENCER STEEL DIVISION, New York, N.Y.

MIRACLE IN ARABIA

Twenty-one Model T-1 ALCO Aircoolers with 3 fans per unit, handle all water cooling requirements at each of five pumping stations on the Trans-Arabian Pipe Line.

ALCO Aircoolers use Hot Desert Air to Cool Water for Tapline Pumping Stations

Cooling jacket water and lube oil cooling water for engines and generators at the pumping stations of the Trans-Arabian Pipe Line is a real engineering feat. Ground or surface water in expendable quantities is not available and although the ambient temperatures range as high as 122° F., ALCO Aircoolers proved to be the economical answer.

ALCO Aircoolers handle all of the water-cooling needs for Tapline pumping stations except at the terminal—at altitudes up to 2700 feet above sea level—a total of 4770 G.P.M.

Dependability of ALCO Aircoolers was an important factor in their selection for this installation. The remote location of these pumping stations called for rugged equipment which would require a minimum of maintenance attention and withstand the ravages of periodic wind and dust storms.

There is little probability that the conditions in connection with your cooling needs are as severe as this one on the Arabian desert. You can be sure, however, that ALCO Aircoolers can solve your problem, too. Write today for a copy of the ALCO Aircooler booklet or see your nearest ALCO Sales Engineer at Chicago, Dunkirk, Houston, Kansas City, Los Angeles, New York or Tulsa. Plants: Dunkirk, New York and Beaumont, Texas.

ONLY ALCO HAS THE BIG 5

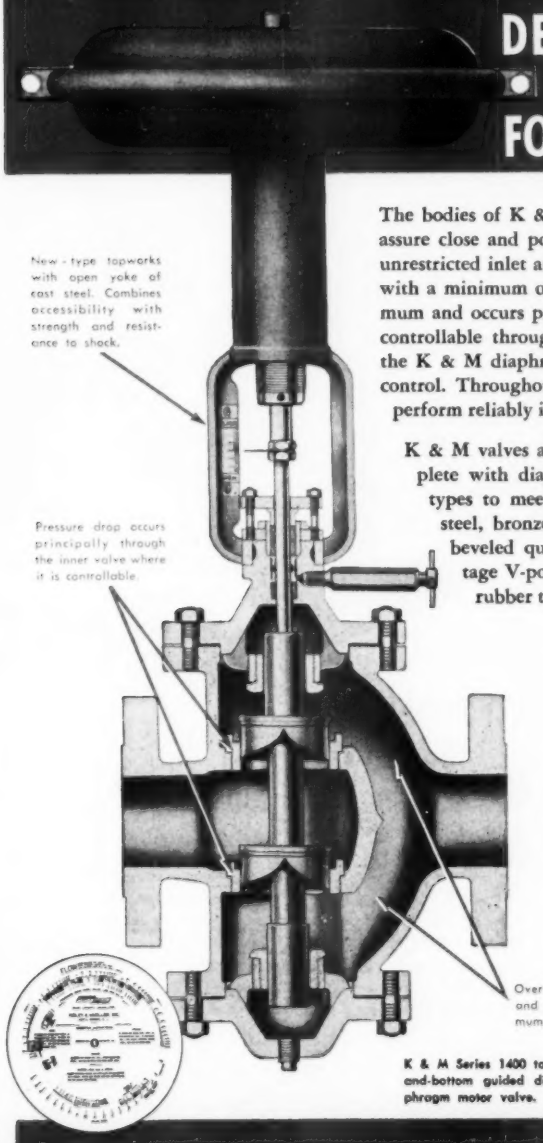
1 Low Cost
2 Flexible Design
3 Efficient Performance
4 Easy Maintenance
5 Quick Installation

ALCO

ALCO Products Division
AMERICAN LOCOMOTIVE COMPANY

In step with tomorrow—ALCO AIRCOOLERS, Heat Exchangers, Evaporators, Feedwater Heaters, Pressure Vessels, Pipe

The Control Valves DESIGNED ESPECIALLY FOR INSTRUMENTATION

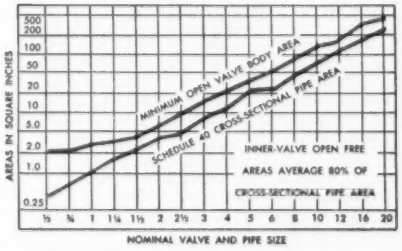

New-type topworks with open yoke of cast steel. Combines accessibility with strength and resistance to shock.
Pressure drop occurs principally through the inner valve where it is controllable.
Over-size, streamlined body areas reduce turbulence and friction to a minimum and assure smooth, maximum flow.

K & M Series 1400 top-and-bottom guided diaphragm motor valve.

The bodies of K & M Control Valves are especially designed to assure close and positive control by instrumentation. They have unrestricted inlet and discharge passages and permit smooth flow with a minimum of turbulence. Pressure drop is held to a minimum and occurs principally through the inner valve where it is controllable through the full valve travel. The construction of the K & M diaphragm motors assures extreme precision in this control. Throughout, K & M Control Valves are engineered to perform reliably in *the most exacting applications.*

K & M valves are available in sizes from ½ to 20-inch, complete with diaphragm motor and are made in 13 different types to meet varying requirements. Constructed of semi-steel, bronze, cast steel or special alloys. Inner valves in beveled quick opening, percentage parabolic or percentage V-port design as standard. Facings range from soft rubber to stellite.

Because of their modern design, all K & M valve bodies have extremely high capacities in relation to corresponding pipe size:



KIELEY & MUELLER

Established 1879

FOR DRILLING TO 10,000 FEET with 4½" drill pipe

WHELAND

B-85 DRAWWORKS

WITH CONSOLE CONTROL

Wheland rotary equipment to match the B-85 drawworks:

HP-14000 7½ x14 350 HP Slush Pump
A-20 . . . . 20½ inch Table Top Rotary
K-2500 . . . . 250 ton Traveling Block
E-6600 . . . . 350,000 lb. cap. Swivel

COMPACT

FAST

QUIET

EASILY PORTABLE

RUGGED

PRESSURE FEED LUBRICATION

This New, Field Proven Wheland Drawworks Makes the Driller King of All He Surveys!

Never before has the driller had such easy and positive control over all drilling operations! With this new Wheland drawworks he can see the whole rig, control drilling operations accurately, quickly, easily.

4 Advantages of WHELAND CONSOLE CONTROL

1. EASY—All controls grouped at driller's fingertips.
2. SAFE—Console may be located in safest areas. Driller can easily see every part of the rig.
3. FAST—Controls respond instantly to a touch of the finger.
4. EFFICIENT—The weight carried on the bit and the speed of rotation are easily controlled.

This field proven Wheland drawworks with console control gives the driller control, visibility and safety never before available in drilling equipment. It is chock full of new performance and convenience features . . . For example: The feed-off characteristics of the Wheland air brake are similar to those of an automatic driller. Metering valve in air system allows minute adjustments in brake application. The rugged 750 HP transmission has forged steel shafts, forged steel, cut tooth, flame hardened sprockets and chain drives designed with a generous safety factor for smooth, trouble-free performance. Precision roller bearings throughout. Pressure feed lubrication . . . Get the whole story on this revolutionary new Wheland drawworks! ***Ask for free bulletin.***

WHELAND

THE WHELAND COMPANY, CHATTANOOGA, TENN., U. S. A.

ROTARY DRILLING MACHINERY

DRAWWORKS • SLUSH PUMPS
ROTARIES • CROWN BLOCKS
TRAVELING BLOCKS • SWIVELS

DOMESTIC DISTRIBUTORS & THEIR HEADQUARTERS: Jones & Laughlin Supply Co., Tulsa, Oklahoma • Houston Oil Field Material Co., Inc., Houston, Texas Iverson Supply Co., Tulsa, Oklahoma • Lucey Products Corporation, Tulsa, Oklahoma • Superior Iron Works & Supply Co., Inc., Shreveport, Louisiana
EXPORT DISTRIBUTOR: Lucey Export Corporation, 233 Broadway, New York 7, New York — Broad Street House, London E. C. 2, England

a a a

(ALCOA ACTIVATED ALUMINA)

dries LPG

(LIQUEFIED PETROLEUM GAS)

ALCOA *Activated* Alumina has had a long and successful history of dehydration of liquids and gases. It has been particularly effective in the drying of propane and butane, the gases so important to the production of the new motor fuel, Liquefied Petroleum Gas.

Propane and butane, passed through beds of ALCOA *Activated* Alumina, are freed of their highly dispersed and dissolved liquid water, eliminating the problem of moisture in pipe lines and the hazards of frozen valves. Since ALCOA *Activated* Alumina is one of the few drying agents that will not shatter on contact with water, it is ideal for this operation. Moreover, it will not swell, soften or disintegrate . . . has high resistance to crushing, shock and abrasion . . . is non-toxic . . . non-corrosive . . . practically iron-free.

Years of use have proved ALCOA *Activated* Alumina to be one of the most effective and efficient desiccants available. Dew points as low as *minus* 100° F.—and even lower—have been obtained and under normal circumstances it can be used for an almost indefinite number of drying cycles.

If dehydration is a problem in your process, you will want to know more about this uniformly pure aluminum oxide. We'll gladly send you complete information. Write to: ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 618G Gulf Building, Pittsburgh 19, Pennsylvania.

Alcoa Chemicals

ALCOA

ALUMINAS and FLUORIDES

ACTIVATED ALUMINAS • CALCINED ALUMINAS • HYDRATED ALUMINAS • TABULAR ALUMINAS • LOW SODA ALUMINAS ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOBORIC ACID • CRYOLITE • GALLIUM

THE ROCKWELL INTEGRATOR

Calculates CHARTS WITH MACHINE PRECISION

. . . WITH LESS MAINTENANCE, LOWER COSTS

Set your sights high and you'll look at a Rockwell orifice meter. You will see a design with stronger parts, better construction. For example, Rockwell orifice meters have a new Teflon bearing stuffing box. This unit never leaks, never needs lubrication. They have positive inking pens that eliminate blurred or unprinted records.

Consider, too the advantage of a unit manometer construction that permits you to interchange high side chambers at will and adapt any range meter to higher or lower differential requirements. This feature can save you plenty on your inventory of complete meters.

You'll also save plenty on routine maintenance, for the Rockwell meter can be disassembled with the simplest tools. Now's the time to look into all the advantages of this superior design. Write the nearest Rockwell office for eye-opening information.

ROCKWELL MANUFACTURING CO.

PITTSBURGH 8, PA.—Atlanta • Boston • Chicago • Columbus
Houston • Kansas City • Los Angeles • New York • Pittsburgh
San Francisco • Seattle • Tulsa

CALL ON "MAINTENANCE"

FOR YOUR REQUIREMENTS OF HIGH PRESSURE SPECIALTIES

Large Houston stocks of the following nationally-recognized products:

- **STAINLESS STEEL** Stud Bolts, Nuts, Cap Screws, Ells, Tees, Unions, Couplings, as well as forged Steel, 3000- and 6000-lb. working pressure.
- **MASON-NEILAN** Reducing and Back Pressure Regulators—Liquid Level Controllers—all types for Oil, Gas, Steam or Water service.
- **CAST STEEL** Flanged End Gate Valves, Forged Steel Globe Valves, Gate and Check Valves.
- **SEAMLESS STEEL** Tube-Turn Welding Fittings, Ells, Tees, Caps and Reducers; Forged Steel Flanges—threaded, slip-on, welding neck, and blind—in sizes from ½" to 24" O.D.
- **HAGAN** Control Equipment, Hall Laboratories Water Conditioning.
- **NATIONAL** Seamless Steel Pressure Tubing, Seamless Steel Heat Exchanger and Condenser Tubes.
- **SMITH** Meters and SPARLING Meters, for your measuring problems in oil, gas, water, and other liquids.

YOUR INQUIRY IS INVITED

MAINTENANCE ENGINEERING CORPORATION

3611 CLINTON DRIVE
P.O. BOX 8637
HOUSTON 1, TEXAS

EQUIPMENT WITH ENGINEERING SERVICE

MECO

WHY STURDYBILT *Prefabricated* HOUSES ARE *BEST* FOR OIL FIELD HOUSING . . .

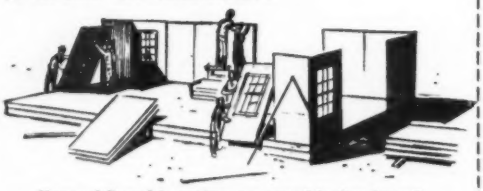
● MOVABILITY

Houses, in complete packages, are moved from factory to site, or from one site to another with a minimum of delay, and practically no loss of material.

● NO WASTE

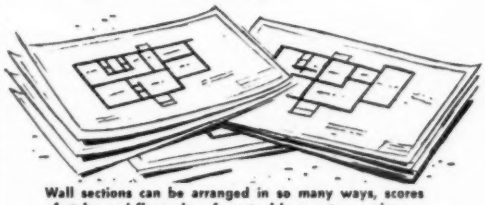
Material cost is cut to the minimum because YOU PAY ONLY FOR THE MATERIAL USED. Sections are Prefabricated, and material is cut to fit at the factory.

● SPEED OF ERECTION



Houses delivered in sections are erected in days instead of weeks. Thus you save much costly time of on-the-job labor.

● VARIETY OF DESIGNS

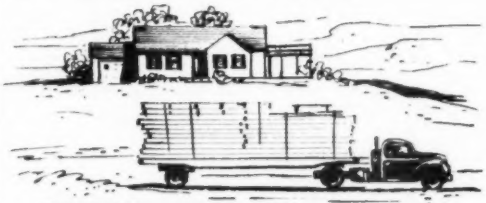


Wall sections can be arranged in so many ways, scores of styles and floor plans from tool houses to warehouses are available.

● WEATHER TIGHT

STURDYBILT sections are precision-built on jigs to assure fitting accuracy. They are tongue and grooved to assure weather-tight construction.

● PERMANENT or TEMPORARY



STURDYBILT Houses over 30 years old are still in use. This record of durability proves that STURDYBILT Houses, although movable, fill the bill for permanent housing.

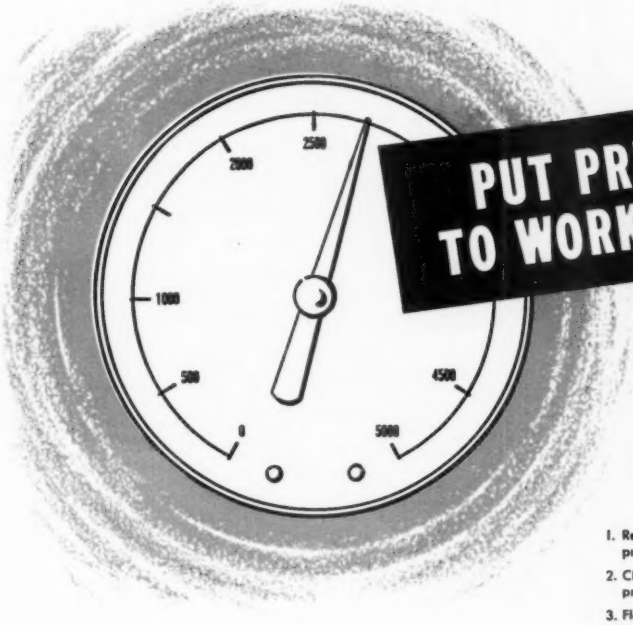
MANUFACTURERS OF SPECIAL MILLWORK • DISTRIBUTORS OF JOHNS-MANVILLE BUILDING MATERIALS • CURTIS WOODWORK

STURDYBILT

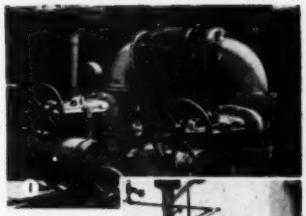
PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. • TULSA, OKLAHOMA

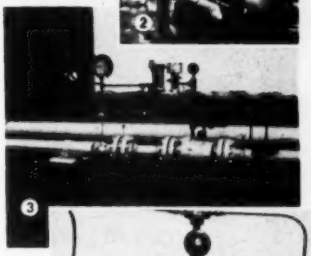
STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

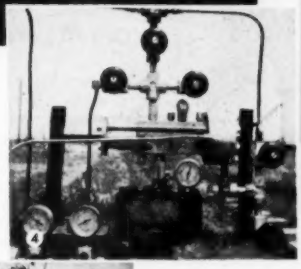


PUT PRESSURE TO WORK FOR YOU



1. Reliever holding back pressure on gas line.
2. Chexflo in gas compressor discharge line.
3. Flexflo automatic shut-off in gas line to heater.





4. Well Head Protection System, T-series Seat-Seal Valves in manifold.
5. Model 899 Separator Oil Valve.

by standardizing... on GROVE valves and regulators

Properly controlled and applied fluid pressures, rather than the mechanical forces of springs, weights or packings, are the outstanding features that characterize Grove designs and products.

The Grove Powreactor Dome principle has revolutionized the design and construction of regulators for high pressure gas, air and other fluids, by eliminating cumbersome springs, weights and levers.

Flexflo and Chexflo valves, resulting from Grove studies of the action of enclosed expanding tubes, effect a positive and unfailing operation never before achieved in the control of pipeline fluids.

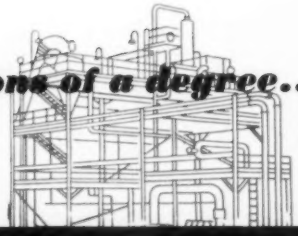
The "O" ring Seat-Seal principle, embodied in "T" and "V" series globe-type valves and "F" and "M" series slide valves, has greatly increased the field of usefulness and the pressure ranges of these valve types.

The products illustrated are only a few examples of the flexibility and adaptability of all these exclusive Grove developments. For your control problems, too, Grove can provide regulators and valves of unequalled reliability. Contact the nearest Grove office today, or address your inquiry to:

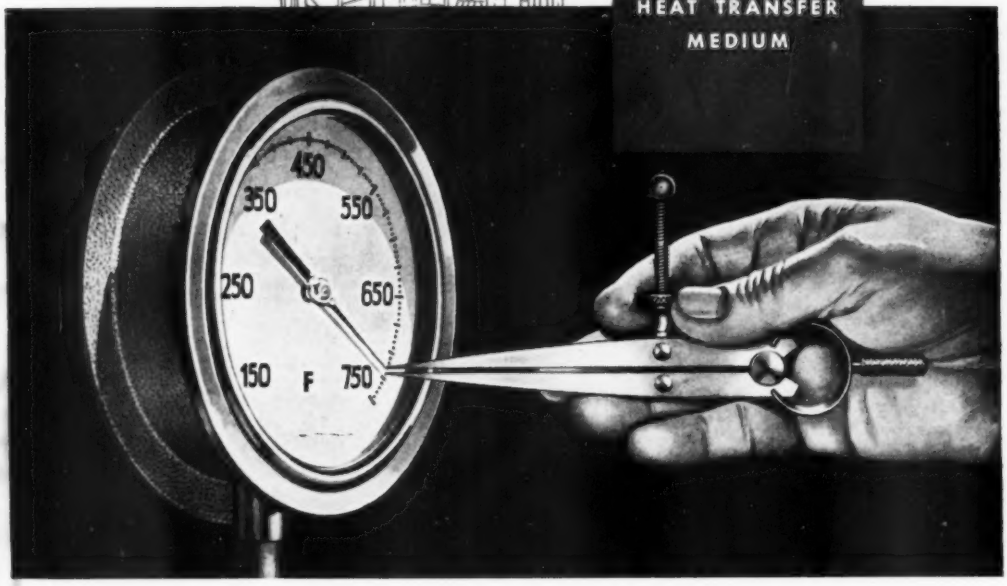
GROVE REGULATOR COMPANY

1901 CALUMET ST., HOUSTON 4, TEXAS • 6529 HOLLIS ST., OAKLAND, CALIF.

within fractions of a degree...



DOWTHERM
the
MODERN
HEAT TRANSFER
MEDIUM



OFFERS ACCURATE PROCESS TEMPERATURE CONTROL!

Today, new refining processes require accurate, high temperatures for complete recovery of many petroleum fractions. With DOWTHERM®, you get both . . . plus an extremely low pressure. DOWTHERM maintains high temperatures to fractions of a degree by pressure regulation. This precise control of high temperatures is retained uniformly over the entire process heating surface. DOWTHERM is a liquid chemical used in an entirely enclosed system in the same manner as steam. When alternate heating and cooling are required, DOWTHERM can be used in the same equipment. Also, coking of the stream may be minimized with the use of DOWTHERM.

With non-fouling properties, DOWTHERM eliminates forced shut-downs of heat processing equipment. For precise heat control at low pressure in your refinery, write Dow today for complete information.

Attention Process Men . . . Use DOWTHERM

. . . for distillation or stripping of rich absorption oils in recovery plants.

. . . for hypersorption processing of light gases.

THE DOW CHEMICAL COMPANY
Midland, Michigan

The Dow Chemical Company, Dept. DO 17
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Company_____

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City_____ State_____

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CHEMICALS
INDISPENSABLE TO INDUSTRY AND AGRICULTURE

SAVED $5000 A YEAR ON A SINGLE WELL ...ON MAINTENANCE COSTS ALONE!

PARKERSBURG *Air Balanced Pumpers*

● That's the kind of savings one major company made on a comparative test of a Parkersburg Air Balanced Pumper against conventional pumpers and gas lifts. Rod jobs which were averaging from 15 to 25 for conventional pumpers were eliminated . . . maintenance costs, both surface and subsurface, were reduced to zero, as compared to other types of pumping equipment which ran from $1875 to $4375.

Regardless of the type of fluid lifting equipment you are now using, you can save money by switching to Parkersburg Air Balanced Pumpers. They cost less to own . . . less to install.

Parkersburg Air Balanced Pumpers are designed to meet the highest standards of quality . . . the peak of efficiency in performance. They pay dividends in the form of savings throughout their many years of service. Ask your Parkersburg Representative for complete details.

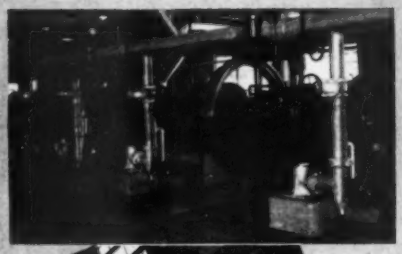
No. 5113

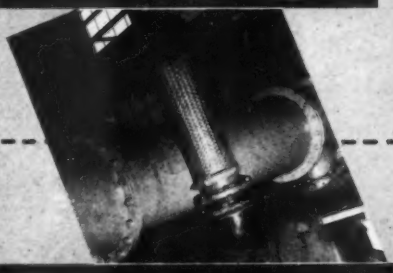
PARKERSBURG

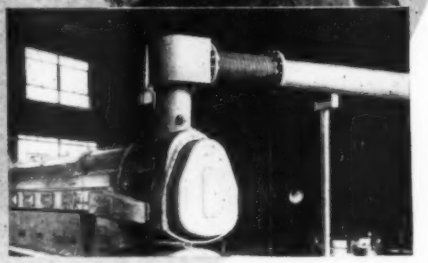
PUMPERS *Air Balanced • Chain Driven • Gear Driven*

Manufactured in Coffeyville, Kansas

Large Diameter CMH REX-WELD CORRUGATED FLEXIBLE METAL HOSE





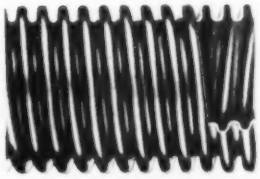


the answer to motion control for:

Diesel Engine Air Intake and Exhaust Lines • Tank Settling Connections • Safety Valve Vent Piping • Compressor Vibration Connections • Heavy Duty Loading and Unloading • And Many Other Services

Wherever large diameter connections must have the flexibility to absorb vibration or expansion and contraction, correct for misalignment or allow movement, and yet provide the rugged durability of metal, CMH REX-WELD Type RW-75 is the answer. REX-WELD Type RW-75 is the flexible connection that requires no packing, no periodical maintenance. All metal construction is completely gas and liquid tight.

For full information and data sheets see your local CMH distributor—look for his name in your classified telephone directory—or write direct.



CMH REX-WELD Type RW-75 is helically corrugated flexible steel hose and is made in sizes from 5" to 24" I.D., inclusive. Furnished with standard pipe nipples, couplings, fixed or floating flanges. Flanges to customers design can also be attached. Where required RW-75 can be supplied with metal braid covering.

Flexon identifies CMH products that have served industry for over 49 years.

CHICAGO METAL HOSE Corporation

1345 S. Third Ave. • Maywood, Ill. • Plants at Maywood, Elgin, Rock Falls, and Savanna, Ill.
In Canada: Canadian Metal Hose Co., Ltd., Brampton, Ont.

CMH

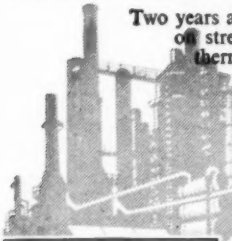
ONE DEPENDABLE SOURCE
for every flexible metal hose requirement

Convoluted and Corrugated Flexible Metal Hose in a Variety of Metals • Expansion Joints for Piping Systems
Stainless Steel and Brass Bellows • Flexible Metal Conduit and Armor • Assemblies of These Components

Shell Repeat Order for Sigmund Pumps

Process Pump Output -over 20,000 H.P.

BIGGEST PROCESS PUMP INSTALLATION EVER DESIGNED AND MADE IN BRITAIN



Two years ago, Shell commissioned the first distillation unit at Cardon, Venezuela and it has been on stream ever since. The process pumps operating in this distiller — along with units for thermal cracking, gas tail, high vacuum and other sections of the refinery, which went into operation shortly afterwards, were supplied by Sigmunds.

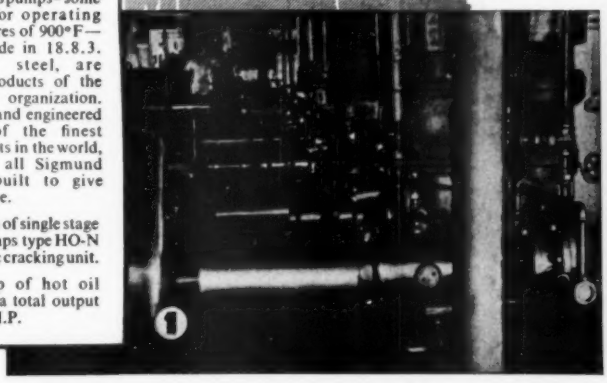
Now the second distillation unit has been put in hand, and once more Sigmund are to be responsible for the pumps. This new contract raises the total of Sigmund pumping equipment at the Cardon refinery to over 20,000 h.p., in a plant which will have an intake of crude oil in the region of 140,000 barrels a day when the additional distillation unit is completed — sufficient to provide over a third of Britain's requirements of petroleum products.

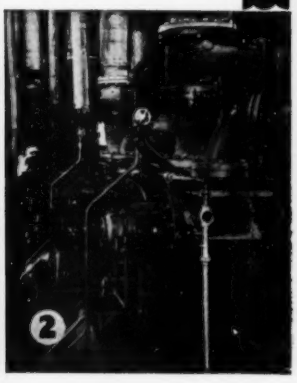
Sigmund Pumps Ltd., Terminal House, 52, Grosvenor Gardens, London, S.W.1.

The process pumps - some of them for operating temperatures of 900°F — others made in 18.8.3. stainless steel, are typical products of the Sigmund organization. Designed and engineered in one of the finest pump plants in the world, and, like all Sigmund pumps, built to give real service.

1. Group of single stage slurry pumps type HO-N in catalytic cracking unit.

2. Group of hot oil pumps of a total output of 3,000 H.P.





S.P.4

New York address: 210 E. 96 Street, N. Y.

Every Advantage for Successful Cementing

LARKIN GEYSER SHOE

1
Made of tough seamless forging.

2
Furnished with any thread desired.

3
High strength, scientifically cured red granite concrete.

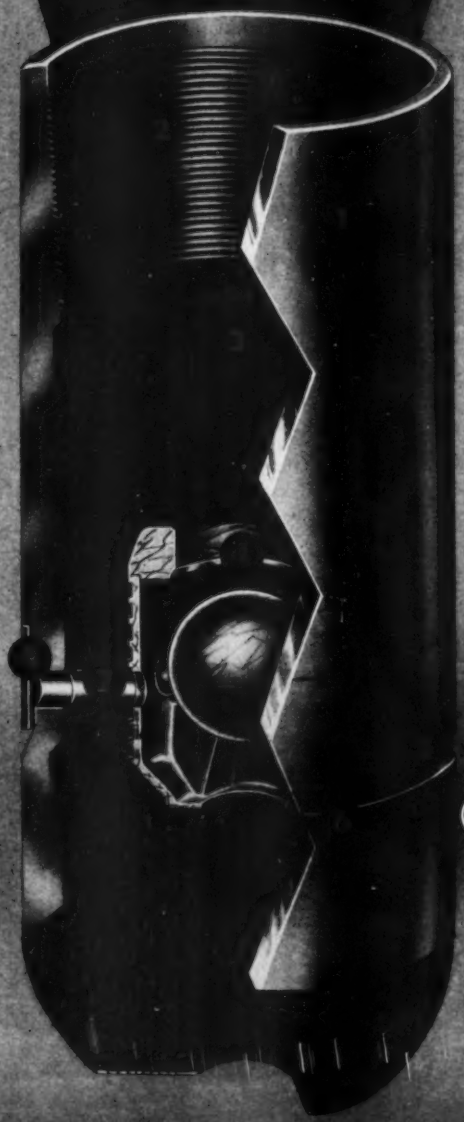
4
Superior all-Bakelite back pressure valve. Concave valve seat is lapped to fit perfectly the contour of the ball. Valve seals immediately against high or low pressures and is stronger than the collapse strength of the casing.

5
Geyser action discharges slurry around the entire periphery of the shoe to assure an even distribution of cement and to minimize channeling.

6
Geyser action up or down.

7
Eight large discharge ports provide unrestricted flow into the peripheral discharge area.

8
Single baffle plate provides powerful 360 degree jetting action.



The Larkin-Field-Proved Shoe design has won in field after field the reputation of doing *all* that a cementing shoe can do to contribute to a successful cementing job. Specify Larkin Geyser Shoes and Collars on your next cementing job. They are sold "... through your Supply Store."

LARKIN

...Through Your Supply Store

LARKIN PACKER COMPANY, INC.
ST. LOUIS, MO.

They Say—

Like a Major Discovery

"The Scurry reef area involves approximately 80,000 acres on which some 1,800 oil and gas wells are now producing. More than 250 separate leases, approximately 90 operators, and some 5,000 royalty owners would be involved in the pooling and unitization.

"The operators and individual owners who have discussed this program seem well pleased with the progress made toward increasing the recovery of oil from the Scurry County reef area, and feel that the best modern methods of oil recovery known to petroleum engineers can be successfully applied if the proposed unitization can be formed without delay. Operator or operators would then be selected.

"It is such conservation projects as this, plus secondary-recovery operations in even older fields, that will increase America's oil production over the years ahead just as though a new major wildcat field were found. . . ."

C. H. Wright, president, Sunray Oil Corp., writing in the Sunray News.

Teamwork for Efficiency

"The New York Yankees are a team devoted to the efficient playing of baseball . . . but in much the same way the 48 states are a team devoted to the furtherance of the common American welfare. In the oil industry the various parts of an integrated company are a team devoted to the efficient supplying of petroleum products to the public.

"You might think from the tone of some government pronouncements that the practice of integration in American business is exclusively a big company operation. That is far from being the case.

"Integration is practiced throughout the whole range of American business, from one-man companies to multibillion dollar corporations. It evolves wherever it happens to make the best economic sense."

T. S. Petersen, president, Standard Oil Co. of California, addressing Portland Chamber of Commerce Forum.

Controls and Regimentation

"Even at their best, price controls are a temporary and superficial expedient. They deal with symptoms, not causes, of inflation. If inflationary pressure is allowed to accumulate beneath them, that pressure will eventually break through the controls. Meanwhile, the controls may have served to intensify the pressure by masking the need for fundamental antiinflationary measures such as keeping the Government's budget balanced and preventing excessive credit expansion.

"Price control necessitates other controls, some of which tend to defeat the purpose of the price control itself. Free prices are the natural regulators of the industrial system. Their function is to keep demand and supply in balance. Price control interferes with this automatic adjustment and makes it necessary to achieve and maintain the balance between demand and supply in other ways—by allocating materials, by rationing, by persuading or compelling individuals to save, by offering special inducements to expansion of output. Such measures are substitutes for price fluctuations. A price-controlled economy is a regimented economy."

The Guaranty Survey, Guaranty Trust Co.

Tax Bouquet

"Beginning September 1 a "gathering" tax goes on natural gas in the Lone Star state. It is a tiny tax but it . . . will produce $14 million the first year in effect.

"The new tax will be on gas consumed in Texas as well as that sucked outside the state. There doesn't seem to be any way to avoid that. But it was considered worth the fractional increase in the price at home to be able to get something from outsiders to repay the state for the loss to other

It's a TRANSITE PIPE salt water disposal line!

Corrosion meets its match when you specify Transite* Pipe for your salt water disposal lines. Under corrosive conditions so severe that other pipe materials have failed in months, this modern pipe has provided years of dependable service.

There are two good reasons for this: First, Transite Pipe is made of asbestos, cement and silica—all corrosion resistant materials. Secondly, it is steam-cured for durability. The result is a pipe that is remarkably resistant to corrosive action of salt water on the inside, corrosive soil on the outside.

But Transite has *other* cost-reducing features as well! Its light weight eases handling and installation . . . most sizes can be unloaded and lowered into the trench without mechanical handling equipment. The factory-made Simplex Couplings speed assembly . . . and provide tight, yet flexible joints. And, in addition, Transite's high carrying capacity helps to keep your pumping costs low.

Transite Pipe for salt water disposal lines is made in a full range of diameters to meet all requirements. You can get further information by writing to Johns-Manville, Box 290, New York 16, N. Y.

*Reg. U. S. Pat. Off.

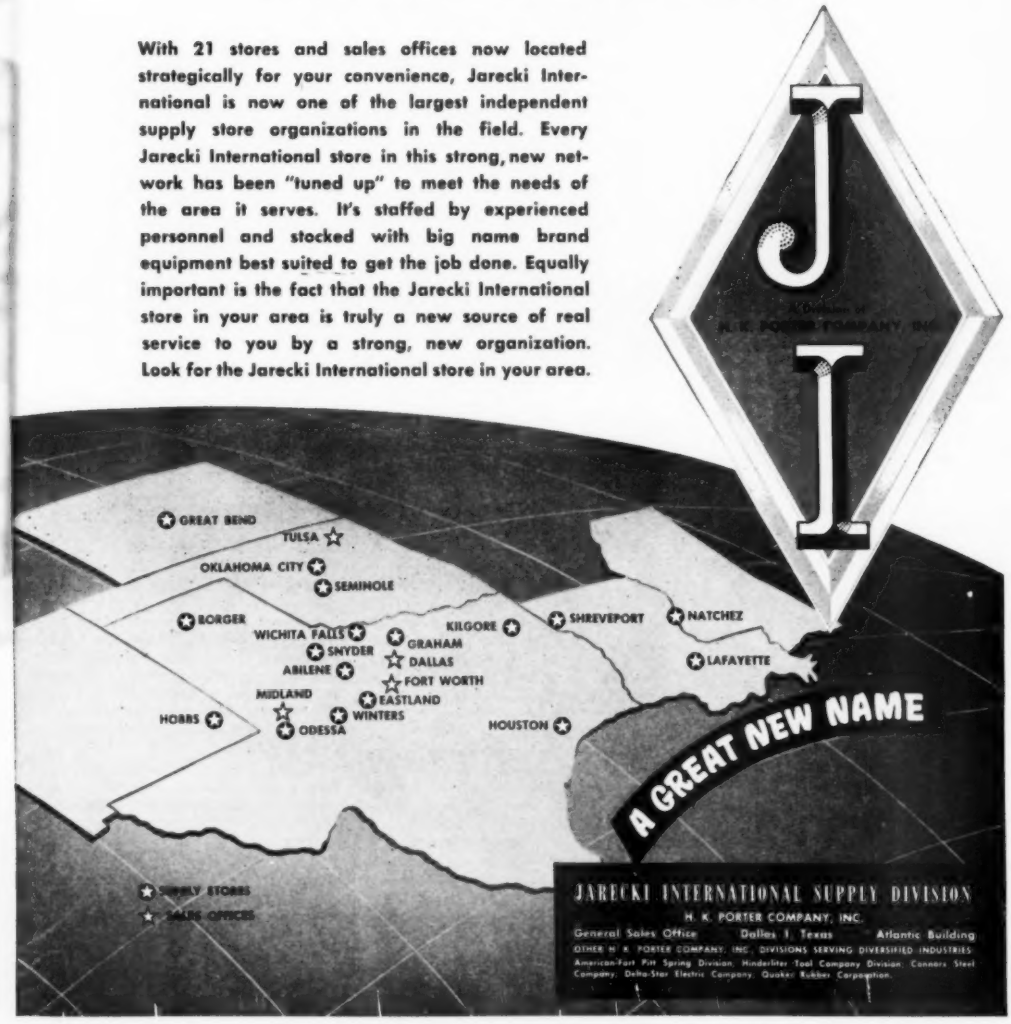
Johns-Manville
TRANSITE PRESSURE PIPE

JARECKI INTERNATIONAL

SINCE 1852 THE OIL INDUSTRY'S FIRST SOURCE OF SUPPLY

...A new source of *REAL SERVICE*

With 21 stores and sales offices now located strategically for your convenience, Jarecki International is now one of the largest independent supply store organizations in the field. Every Jarecki International store in this strong, new network has been "tuned up" to meet the needs of the area it serves. It's staffed by experienced personnel and stocked with big name brand equipment best suited to get the job done. Equally important is the fact that the Jarecki International store in your area is truly a new source of real service to you by a strong, new organization. Look for the Jarecki International store in your area.



states of this irreplaceable natural resource. . . .

"We think the Texas Legislature has been intelligent about this matter, and look with our usual envy upon their action. Perhaps after they collect a hundred million or so and put it into good schools and good roads we'll wake up and follow suit."

Editorial in the Tulsa Tribune.

Drilling-School Need

"The need for a school of drilling engineering cannot be overestimated. In former years, an oil company production manager learned the business from rule-of-thumb methods. We need to establish a college course leading to the granting of a degree in drilling engineering at our state universities.

"Undergraduates would get rig experience working with various contractors during summer months. The college program would be built around a schedule much like similar courses granted in mechanical engineering except that it would be channeled into courses directly pertinent to drilling methods and techniques, hoisting and allied equipment, prime movers, penetration rates, bit performance, and the like.

"The end point, improvement in existing drilling techniques, might offer research possibilities at the graduate level."

William T. Payne, president, Big Chief Drilling Co., and past president, American Association of Drilling Contractors, Oklahoma City.

CALENDAR

July

Western Petroleum Refiners Association, regional meeting, Broadview Hotel, Wichita, July 19-20.

Wyoming Geological Association, sixth annual field conference, Rawlins, Wyo., July 31-August 3.

August

Wyoming Geological Association, sixth annual field conference, Sinclair, Wyo., August 1-3.

Society of Automotive Engineers, Inc., West Coast meeting, Olympic Hotel, Seattle, August 13-15.

Western Petroleum Refiners Association, regional meeting, Leonard Refineries Auditorium, Alma, Mich., August 17.

American Institute of Electrical Engineers, Pacific general meeting, Multnomah Hotel, Portland, Ore., August 20-23.

Eleventh Annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va., August 27-29

September

American Chemical Society, 120th national Diamond Jubilee meeting, Hotel Statler, New York City, September 3-7.

Pacific Coast Gas Association, annual convention, Fairmont Hotel, San Francisco, September 4-6.

Michigan Petroleum Association, annual fall convention, Ramona Park Hotel, Harbor Springs, Mich., September 6-7.

International Union of Pure and Applied Chemistry, sixteenth conference, Hotel Statler, New York City, September 8-9.

New York Oil Heating Association, Inc., Hotel Statler, New York City, September 10.

International Congress of Pure and Applied Chemistry, twelfth conference, Hotel Statler, New York City, September 10-13.

Instrument Society of America, Coliseum, Houston, September 10-14.

American Society of Mechanical Engineers, Industrial Instrument and Regulators division, Coliseum, Houston, September 10-14.

National Petroleum Association, Hotel Traymore, Atlantic City, September 13-14.

International Union of Pure and Applied Chemistry, sixteenth conference, Hotel Statler, Washington, D. C., September 14-15.

American Institute of Chemical Engineers, national meeting, Sheraton Hotel, Rochester, N. Y., September 17-19.

Western Petroleum Refiners Association, regional meeting, Hotel Henning, Casper, Wyo., September 20-21.

American Association of Oilwell Drilling Contractors, eleventh annual meeting, Texas Hotel, Fort Worth, September 24-25.

American Society of Mechanical Engineers, sixth petroleum mechanical-engineering conference, Mayo Hotel, Tulsa, September 24-26.

American Society of Mechanical Engineers, fall meeting, Radisson Hotel, Minneapolis, September 25-28.

October

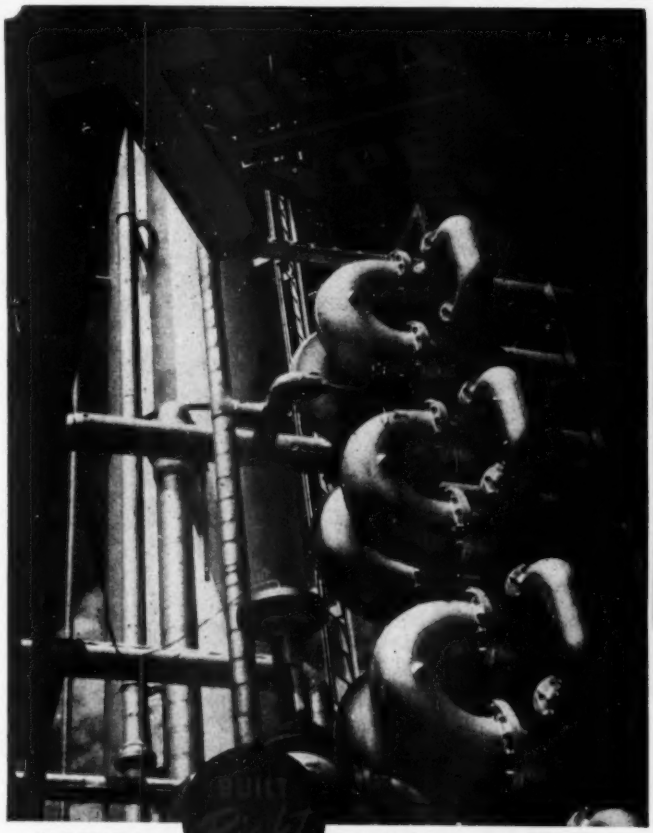
American Institute of Mining and Metallurgical Engineers, petroleum branch, fall meeting, Oklahoma City, October 3-5.

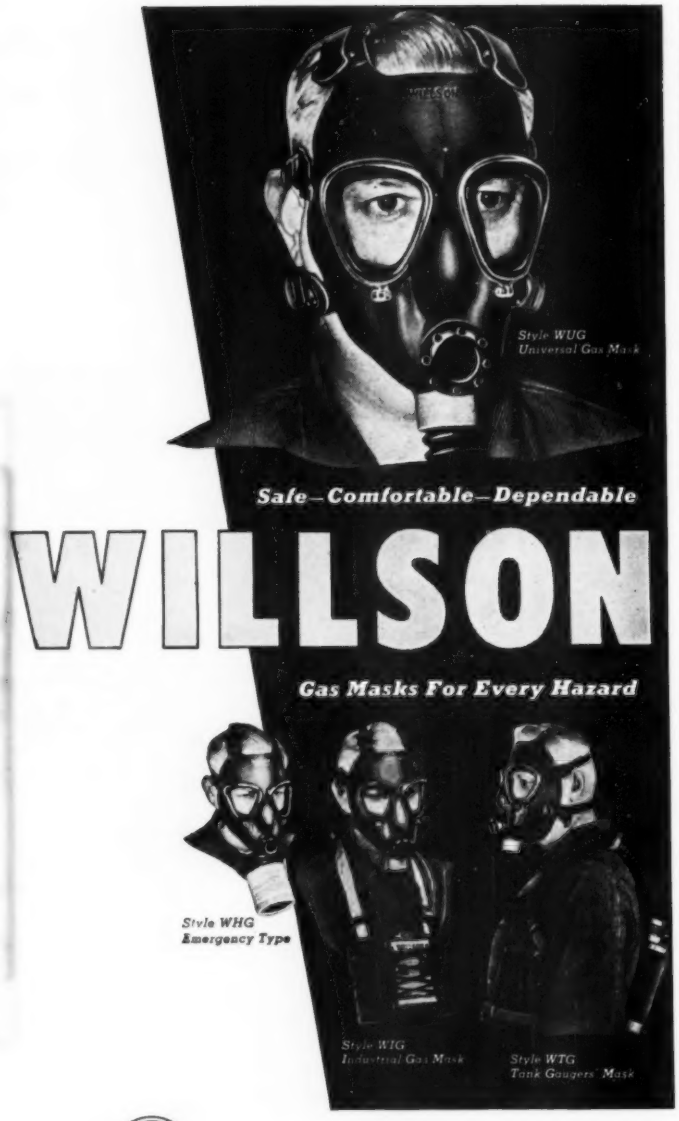
California Natural Gasoline Association, twenty-sixth annual fall meeting, Ambassador Hotel, Los Angeles, October 4-5.

Texas Mid-Continent Oil and Gas Association, annual meeting, Hotel Beaumont, Beaumont, Tex., October 8-9.

American Oil Chemists' Society, fall meeting, Edgewater Beach Hotel, Chicago, October 8-10.

National Safety Council, thirty-ninth na-





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tional safety congress and exposition, Stevens Hotel, Chicago, October 8-12.

Indiana Independent Petroleum Association, fall convention, Hotel Severin, Indianapolis, October 13-14.

Oil Progress Week, October 14-20.

American Petroleum Credit Association, twenty-seventh annual conference, Adolphus Hotel, Dallas, October 15-17.

American Gas Association, annual convention, Kiel Auditorium, St. Louis, October 15-17.

National Metal Congress and Exposition, American Society for Metals, American Welding Society, American Institute of Mining and Metallurgical Engineers, and Society for Non-Destructive Testing, Hotels Statler, Book-Cadillac, and Detroit-Leland, Detroit, October 15-19.

Institute of Gas Technology, annual meeting, Chicago, October 18.

National Association of Corrosion Engineers, South Central Region, annual meeting, Corpus Christi, Tex., October 18-20.

Independent Petroleum Association of America, Shamrock Hotel, Houston, October 21-23.

American Institute of Electrical Engineers, fall general meeting, Hotel Cleveland, Cleveland, October 22-26.

Society of Automotive Engineers, diesel-engine division, Drake Hotel, Chicago, October 29-30.

Society of Automotive Engineers, fuels and lubricants division, Drake Hotel, Chicago, October 31-November 1.

November

Louisiana-Arkansas Division, Mid-Continent Oil and Gas Association, twenty-ninth meeting, Roosevelt Hotel, New Orleans, November 1-2.

American Petroleum Institute, thirty-first annual meeting, Stevens Hotel and Palmer House, Chicago, November 5-8.

Gulf Coast Association of Geological Societies, first annual meeting, Roosevelt Hotel, New Orleans, November 15-17.

Rocky Mountain Oil and Gas Association, annual meeting, Cosmopolitan Hotel, Denver, November 15-17.

Society of Exploration Geophysicists, regional meeting, Baker Hotel, Dallas, November 19-20.

American Society of Mechanical Engineers, annual meeting, Chalfonte-Haddon Hall, Atlantic City, November 25-30.

Twenty-third Exposition of Chemical Industries, Grand Central Palace, New York City, November 26-December 1.

December

American Institute of Chemical Engineers, annual meeting, Chalfonte-Haddon Hall, Atlantic City, December 2-5.

Chemical Specialties Manufacturers Association, thirty-eighth annual meeting, Mayflower Hotel, Washington, D. C., December 3-4.

New York Oil Heating Association, Inc., Hotel Statler, New York City, December 10.

NOMADS

Tulsa Nomads, third Friday of each month. After Five Room, Tulsa Hotel.

Dallas-Fort Worth Nomads, first Monday of each month, Greater Dallas Club.

Houston Nomads, second Monday of each month, Ye Olde College Inn, Houston.

Los Angeles Nomads, second Wednesday of each month, Jonathan Club.

New York Nomads: September 11, luncheon, Downtown Athletic Club; September 18, golf party, Knoll Golf Club, Boonton, N. J.; October 1 and October 29, regular meetings, Louis Sherry's; December 8, Christmas dinner dance, Hotel Pierre.

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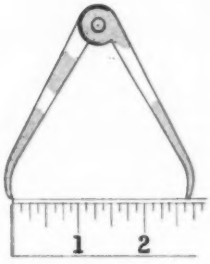

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JOURNALLY Speaking

Mysterious Naphtha

VIEWING the oil troubles in Iran from the philosophical detachment of a student of the history of mankind, it would seem that the root of the difficulty may be the aura of mystery which the people of the Middle East have always placed around petroleum.

Petroleum has been known in the part of the world now called Iran as far back as written history goes, and that is quite a ways in those parts. It rose to the surface of springs and rivers in considerable quantities and was variously known as bitumen, pitch, asphalt, and naphtha. These pools often caught fire and burned for years, and so came to be associated with the deities of the times. This inflammable characteristic of the indigenous naphtha probably was the basis for Zoroastrianism, the cult of fire worship, which flourished in ancient Persia.

In Babylon, the region around the twin Tigris and Euphrates rivers, whose joint delta laps the island of Abadan and its troubled refinery, bituminous residuum from oil springs was used to calk boats and baskets, a practice which persists to this day. The myths of Babylonia and Assyria record that about 3800 B.C. King Sargon of Accad, while an infant, was placed in a reed basket coated with asphalt and floated down the Euphrates to escape enemies, just as the infant Moses later escaped down the Nile.

The Sumerians, who inhabited the region around 3600 B.C., made small statuettes and amulets from a mixture of bitumen and clay. Later the Chaldeans used this asphalt as mortar for their mud bricks, and some of these structures can still be found in Mesopotamia. Petroleum entered into their religious observances also, and the "fiery furnace" through which Shadrach, Meshach, and Abednego, those heroes of the Jewish Babylonian captivity, passed unharmed, undoubtedly was fueled by naphtha.

Ancient Greek historians were much intrigued with Persia's petroleum, mentioning it frequently, and they, too, viewed it as something mysterious and with supernatural attributes. It was thought to have great healing powers, and the more evil-smelling (sulfurous), the better its therapeutic properties.

Before Mohammedanism swept Persia the dominant religion there was fire worship, and the priests of this cult built altars and temples over the "eternal fires," or burning oil springs and gas seepages. The ruins of one such temple still stand in what is now Masjid-i-Sulaiman oil field, largest of the producing fields of Anglo-Iranian Oil Co., though the name comes from a much later Mosque of Solomon.

Thus through the ages the inhabitants of the Middle East have never fully understood the oil that underlies their land, but have revered it as something with mysterious power for good or evil. Then came the Europeans and Americans, whose latter-day civilization had advanced far beyond the point where that of Hammurabi and Nebuchadnezzar stopped, and they used the oil of Persia for purposes even more mysterious and wonderful. Instead of cementing huts with it, they cemented industrial empires.

Now the Iranians want to control this mysterious power themselves. Last month when the British negotiators arrived in Teheran to attempt a settlement the Iranian officials first drove them through the slums of the city and declared that nationalization of oil would wipe out squalor and poverty and bring prosperity to the entire country. This incident, and subsequent statements, suggest that Iranians still are obsessed by a vestige of the fire worship of their ancestors, that they are attributing too-mysterious powers to their naphtha.

What they overlook is an added ingredient—men and their skill in extracting and using petroleum. Americans have been accused of worshipping technology, but it has produced more results than fire worship. Perhaps the Iranians would do better to covet and adopt the methods that have made their naphtha what it is today.

The technology developed by the western world is far more marvelous than the petroleum on which it operates, but without it natural resources are of little value. But to many people, not all of them in the Orient, its functioning is as great a mystery as naphtha was to the Babylonians.

Henry D. Ralph.

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• NEWS FEATURES

Refiners Asked to Cooperate in Study of Graphitization of Steel ... 57
Sun Makes Available Commercial Method of Purifying Aromatics ... 58
Industry Briefs ... 59
Crude Line from McCamey to Houston Refining Center Planned ... 60
Honolulu Refinery Expands Facilities to Produce Asphalt ... 61
NPC Estimates of Steel for Foreign Operations Ratified by U. S. ... 62
U. S. Pondering What Steps to Take to Replace Iranian Oil ... 63
New Oil, Gas Problems May Be Tossed in NPC's Lap ... 64
Serious Shortage of Structural Steel Forecast by DPA ... 65
Restrictions on Gas to Apply Principally East of Mississippi ... 66
Riots in Teheran Greet Arrival of Harriman ... 67
Thornburg Blames British for Nationalization Trouble in Iran ... 68
Iraq Government Expected to Get 50-50 Income Split from I.P.C. ... 70
501 Rotary Rigs Running in Foreign Areas, Survey Shows ... 70
Creole's May Production Off But Drilling Trend Continues Rise ... 72
Po Operations Appear Slated for Control by Italian Government ... 153
Russian Development of Matzen Field Is Raising Production ... 153

• ENGINEERING-OPERATING FEATURES

Texas Gulf Producing 300 Tons of Sulfur Daily at Worland ... 78
Organizing, Designing, and Operating a Salt-Water Disposal Plant ... 80
Automatic Gas-Booster Station Aids Conservation ... 84
Aluminum's Role in Refinery Equipment ... 87
Influence of Hole Size in Shot-Hole Drilling ... 88
Sound Engineering Practices Increase Recovery Efficiency ... 95
Corrosion and Its Control: Ground Beds ... 100
An Investigation of Torque-Converter Drives on Mud Pump ... 101
Correction Factors for Balancing Effect of Gas in Manometer ... 107
Questions on Technology ... 114
Refiner's Notebook: Factors Affecting Throughput in Cat Cracking ... 115
Engineering Fundamentals: Effect of Formation-Volume Factor ... 117
Oil and Gas Equipment Digest ... 119

• EXPLORATION-DEVELOPMENT

Eastern Montana's Paleozoic Tests ... 139
Highlights of Week's Developments ... 139
Reports by Areas Start on Page ... 140

• REGULAR DEPARTMENTS

They Say ... 45
Calendar of Events ... 47
Journally Speaking ... 51
Editorial ... 55
This Week ... 56
Watching Washington ... 64
International News ... 67
Personals ... 73
Deaths in the Industry ... 76
Book Reviews ... 113
Refining News ... 123
Pipe-Line News ... 127
On the Line ... 129
Drilling Contractors ... 133
Natural-Gas News ... 137
Natural-Gasoline News ... 137
Exploration Statistics ... 154
Production Statistics ... 155
Refining Statistics ... 156
Market Statistics ... 157
Equipment Men in News ... 159
Classified Advertising ... 161
Advertisers' Index ... 165

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At the Start

WASHINGTON.—What's the status of Government from the viewpoint of industry at the start of another fiscal year?

More than 100 editors of business papers were briefed apropos this query at a 2-day national conference here. Petroleum situations bobbed up frequently as the editors representing all the basic industries and many enterprises obtained background information on what is happening today and what's ahead for the coming year.

Information came direct from legislative and administrative leaders including Taylor, Fleischman, Boyd, Morgan, Harriman, Skuce, Pike, Symington, and Clarence Brown.

Outstanding was the fact that business leaders have returned to top defense positions and are doing their best under conditions which in some respects are more difficult than those of World War II. In some instances, including PAD, needed personnel from industry are not being added for the simple reason that office facilities are not available.

Congress is reluctant to delegate full authority to top administrative leaders in the cabinet and elsewhere because of a lack of confidence in their abilities. This tends to slow down parts of the defense program where Government seeks powers comparable to those exercised during 1942-45.

Congressional leaders of both parties are insistent that there is waste in both military and civilian spending which, if ended, would do away with the necessity of further taxes. Additional taxes will have to come from different sources.

At the same time administrative leaders are strong in their contention that a permanent truce in Korea in no important way should change the defense program. They contend that if Congress ends rollbacks and circumscribes other pricing policies then the entire control program, including wage stabilization, might as well be junked.

Herein lie basic differences between administrative and legislative planning, which will have to be resolved before the second year of the present emergency can be projected.

The Controlled Materials Plan seeks to solve most of the acute material shortages within a period of months. Output for civilian uses should be at the 1948-49 level by early 1953, assuming no defense expansion.

Petroleum as usual figures prominently in national and international policy as discussed at the conference. A prolonged cessation in Iranian oil output, as now appears probable, will bring world-wide adjustments, including expansion in crude-oil production and refinery output in this hemisphere. Civilian rationing in this country is not in prospect.

So far as the principal products from petroleum are concerned all the usual and special needs are being supplied adequately. In contrast to several other industries this industry has its house in order. It can be kept that way provided the construction and operating program which has been explained to Government receives continuing consideration.

THIS WEEK

INTERNATIONAL—Riots break out in Teheran following arrival of Averill Harriman. . . . Abadan refinery down to 85,000 bbl. per day, with no products leaving Iran. . . . India already reported hard hit by aviation-gasoline shortage. . . . High government officials developing policy on U. S. participation in move to fill gap created by nationalization trouble. . . . Leaders feel hole must be plugged, but without creating shortages of gasoline and heating oils in this country. . . . ¶Survey shows 501 rotary rigs operating outside U. S. and Canada in countries other than western Germany and those controlled by Russia. . . . Figure is higher than previous all-time record. . . . Activity in Mexico doubled since last year. . . . ¶Agreement expected soon between Iraq Government and Iraq Petroleum Co. giving government 50-50 split of oil revenues. . . .

CONSTRUCTION—PAD issues 26 more certificates for accelerated amortization of refining and transportation facilities. . . . Biggest project is $6,015,000 natural-gasoline plant planned by Phillips Petroleum in Sherman County, Texas. . . . ¶Oil industry warned of serious structural-steel shortage during last 4 months this year. . . . DPA says applications are for nearly twice amount of structural steel available. . . . Industry construction to be curtailed and steel use in machinery and equipment to be limited. . . .

ACTIVITY—Daily average crude production for week ended July 14 was 6,088,950 bbl., down 4,750 bbl. . . . ¶Well completions for the week were up 38 wells to 875. . . . Wildcat completions totaled 191 compared with 200 for previous week and 165 for same week last year. . . . ¶Rotary rigs operating in United States on July 9 decreased 11 rigs to 2,561. . . .

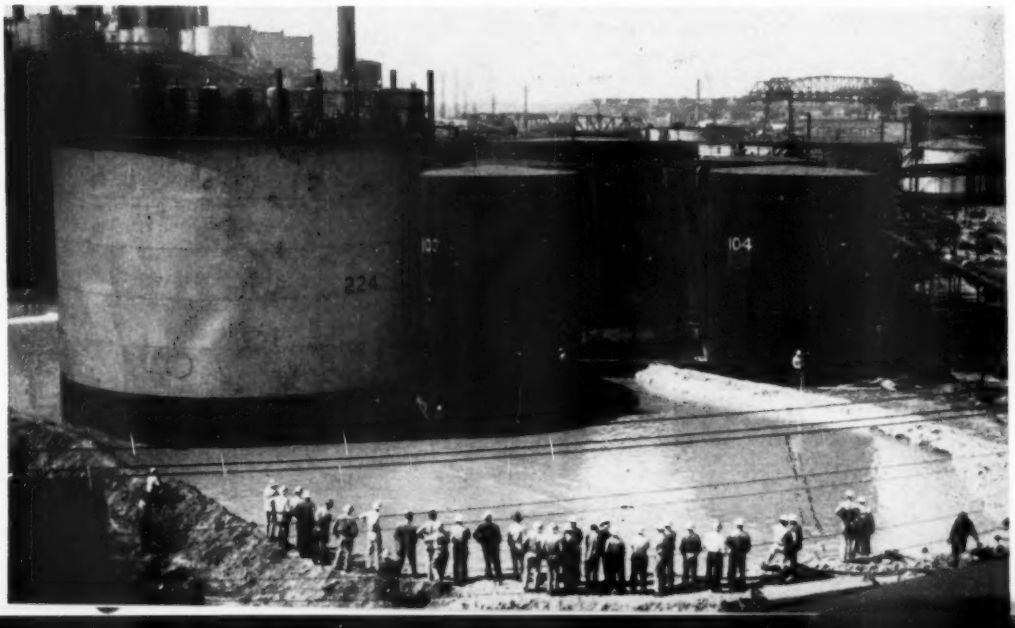
TRENDS—Major product stocks increased 6,744,000 bbl. for week ended July 7, the largest weekly increase since the war. . . . Combined stocks of kerosine, distillate, and residual fuels gained almost 1,000,000 bbl. daily. . . . More than half of kerosine production for the week went to storage. . . .

GOVERNMENT—Chapman says planned restrictions on gas companies will apply only east of Mississippi River except for some "tight" areas in five states. . . . ¶FTC asks House subcommittee to report unfavorably a bill legalizing price cutting in "good faith" to meet competitors prices. . . . Senate expected to vote on McCarran bill within 2 weeks. . . . ¶NPC expected to be asked to make additional oil studies at forthcoming meeting, including gas-production situation, how to meet oil loss caused by shutdown in Iran. . . .

PIPE LINES—Shell announces plans for 24-in. crude line from McCamey, Tex., to Houston refining area. . . . Six companies participating in project, with Shell to design, build, and operate system. . . . Line to have initial capacity of 209,000 bbl. per day, cost $35,000,000. . . . ¶General Petroleum Corp. places San Ardo crude line in operation. . . . System uses heat, cutter oil to move heavy, sticky San Ardo crude to Estero Bay terminal. . . .

REFINING—Sun announces new process for purifying aromatics. . . . Will build first unit at Marcus Hook refinery. . . . Houdry, U.O.P. authorized to license process, termed "Arosorb." . . . ¶Pacific Refiners begin production of full line of paving asphalts and oxidized asphalts at Honolulu refinery. . . . ¶A.P.I. subgroup asks refiners' cooperation in finding solution to problem of graphitization of steel vessels used in refining service. . . .

MAKING WAY FOR PROGRESS.—It takes a lot of preparation for just a short trip when the passenger is a 350,000-gal. gasoline-storage tank. Standard Oil Co. (Ohio) found this one in its way when it started construction on a $5,500,000 crude-oil distillation unit at its Cleveland refinery, so workers built dikes, created this lake, and floated the 75-ton tank 165 ft. to a new location. Sohio broke ground for the new distillation unit April 30. Completion is planned for March 1952.



Cracked-Cracker Study

Refiners asked to cooperate in investigation designed to prevent future reactor failures due to graphitization

George Weber

NEW YORK.—Last spring's graphitization scare, which conjured up visions of widespread reactor failures in catalytic cracking units, has by now been largely modified.

Still a serious problem, graphitization is already the subject of several coordinated studies organized to find out how it may have contributed to the failure of three fluid catalytic cracking reactors and what its future effect might be on steel vessels and piping used in high temperature refining service.

A long-term program, the graphitization study will benefit all refiners, and the industry as a whole is being urged to cooperate by supplying samples and data which will contribute to the research effort. The urgency of the problem is still evident, but the early alarm which attended the failure of the three reactors is now believed to have been overemphasized.

What happens.—It has long been general knowledge that carbon steel under high-temperature conditions will graphitize. Iron and carbon, the major components of steel, are usually combined as iron carbide existing within steel. This compound is considered to be, to a greater or lesser extent, metastable in nature. Under certain conditions, however, the carbon can separate from the steel and form nodules or platelets of substantially pure carbon, thus converting the metal to a state of substantially pure iron. High temperature is one of the conditions which promotes this deterioration, which is termed graphitization.

Graphitization was at first attributed to be the sole or principal cause of failure of the three reactors. On further study of samples taken from the vessels, many metallurgists have come to agree with the views of some of the experts immediately concerned with the problem; that failure in fact resulted from stress rupture. This view, however, grants the possibility that graphitization which was found to be present in the samples, may have contributed to the failures.

The three reactors, located in refineries at Baytown, Tex.; Baltimore, Md.; and Aruba, N.W.I.; were of identical composition and fabrication. The model consisted of a relatively thick, integrally bonded, Austenitic 18-8 alloy liner deposited on a carbon steel shell.

Cracks in the carbon steel occurred generally in the vicinity of welds. Severe graphitization was found in both the plate and heat-affected areas near the welds. To date these are the only reactor failures known to have occurred under these circumstances. Some pipe failures occurring outside the oil industry have been attributed to graphitization.

Action taken.—Graphitization and its possible role in vessel failures was a prominent topic at the midyear meeting of the American Petroleum Institute Division of Refining held in Tulsa last May.

Unfortunately, up to that time the topic comprised more rumor than fact. The facts, as they were known then, were reviewed at a special meeting set up by the A.P.I. Subcommittee on Unfired Pressure Vessels. They revealed correctly that while graphitization was a generally known phenomenon, little was known of the specific effects of steel composition, prior heat treatment, welding conditions, post treatment after welding, and time and temperature of exposure on graphitization.

These factors, plus an investigation to determine the extent to which such changes in the structure of steel affect the physical properties of the steel, emerged as the primary subjects for study.

The A.P.I. Committee on Refinery Equipment took immediate action, authorizing the appointment of a subgroup of the Subcommittee on Unfired Pressure Vessels on Deterioration of Steels at High Temperatures. That subgroup now consists of three members: J. G. Wilson, of Shell Oil Co., chairman; M. S. Northup, Standard Oil Development Co.; and G. W. Watts of Standard Oil Co. (Ind.). The new subgroup was charged with establishing a program, implementing this program, and reporting the results to the industry.

Program outlined.—Last week the subgroup submitted its first report covering the general considerations and program to be followed.

Noting that actually there is very little information as to the condition of equipment operating at high temperatures and that additional information is required, the committee has directed the program principally toward obtaining this information and disseminating it to all concerned.

The first step is a survey now being made to determine how many samples of steel will be taken by participating companies. The report outlines the methods for taking samples and the examination to be made of such samples. Samples should be taken from vessels and piping which have operated normally at 800° F. or above. Examination should be made by qualified laboratories and should include:

1. Microscopic examination.
2. Complete chemical analysis.
3. Carburization test (McQuaid-Ehn) to determine grain size and abnormality.
4. Special bend test.

A special report giving specific details on these procedures will be issued by the subgroup in the near future. The subgroup is also surveying laboratories to determine which ones are in a position to handle the samples. Participating companies will be charged for the laboratory examinations, which will range in cost from $500 to $250 per sample for complete examinations, depending on the volume of samples contributed.

It is assumed that there will be participation by most operators of pressure vessels at temperatures above 800° F. Smaller companies not represented on the Committee on Refinery Equipment will be represented by Universal Oil Products Co. Widespread participation in the program will be welcomed.

As soon as sufficient facts are available, suitable action will be taken by the subgroup with steel manufacturers, probably through the American Society for Testing Materials, to determine what can be done to set up a specification for, and to obtain, graphitization-proof steel for use at high temperatures.

Other committees.—The A.P.I. subgroup's program includes plans for exchange of information with other groups studying graphitization. Four such bodies are now making such studies. Two operate under the A.S.T.M.-A.S.M.E. Joint Committee on Effect of Temperature on the Properties of Metals. They include the Petroleum and Chemical Panel and Project 29 on the Stability of Steels as Affected by Temperature. A Subgroup on Graphitization is also active under the Pressure Vessel Research Committee of the Welding Research Council. In addition, the Edison Electric Institute's Research Committee has a subgroup on graphitization, and the A.S.M.E. Stress Committee is interested in graphitization.

Prompt action by the A.P.I. subgroup, aided by all refiners, should contribute substantially to the coordinated research work on graphitization. This concerted organization of the entire industry is expected to reduce the threat of equipment failure substantially in the future. It has already modified the industry's attitude from that of sudden alarm to one of promised correction.

New Arosorb Process

Sun makes available commercial method for purifying aromatics; to build first unit at Marcus Hook refinery

George Weber

THE purification of benzene, toluene, and other aromatics occurring in a mixed hydrogen stream is now available to the refining industry on a commercial basis in the form of a new process which employs the principle of selective adsorption.

Termed the "Arosorb" process, the technique may be applied in the separation of aromatics produced in any of the available catalytic reforming processes, whose primary importance at present concerns their ability to convert straightrun naphtha fractions to highly aromatic reformates.

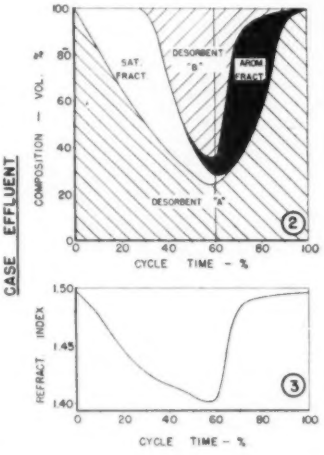
Arosorb was developed on a commercial basis by Sun Oil Co. It is based on the technique of selective adsorption of aromatics on silica gel, which was used by Dr. F. D. Rossini on an analytical scale in his work under the American Petroleum Institute's Project No. 6. The commercial process represents 8 years of research by Sun, with an assist by Davison Chemical Corp. of Baltimore, which has developed a special form of silica gel.

Sun to build first.—The first Arosorb unit will be built by Sun to process the reformate produced in the new 10,000-bbl. per day Houdriforming unit now being built at the Marcus Hook, Pa., refinery. As part of the $8,000,000 project, the Arosorber will concentrate and purify annually a total of 13,000,000 gal. of benzene, 30,000,000 gal. of toluene and 15,000,000 gal. of mixed xylenes.

Other uses.—While the initial uses to which this process will be put will involve the purification of the above aromatics now in such short supply, the technique has a broad flexibility which will permit its use in other operations. According to Sun engineers, it may be adapted to the recovery of other petroleum solvents, the improvement of furnace and diesel fuels, and, outside the petroleum industry, to the separation of other chemicals otherwise difficult to recover or purify.

For example, while the first unit will be used primarily to concentrate benzene and toluene, it may also be adapted to separate a highly concentrated xylene mixture from higher-boiling charge stock containing aromatics and aliphatics.

Arosorb, says Sun, is the first large-scale commercial application of selective adsorption utilizing silica gel. That synthetic amorphous form of silica shows unusual preference for adsorbing aromatic compounds from a mixed stream containing paraffins, olefins and naphthenes. When used to concentrate benzene and toluene, the reformate will be prefractionated to exclude heavier molecular weight aromatics.



Figs. 2-3.

How it works.—The selected feed stock is passed through a bed of silica gel which adsorbs the benzene and toluene and allows the paraffins, naphthenes, and other nonaromatic hydrocarbons to pass through the fixed bed. When the silica gel reaches its capacity for adsorbing the two aromatics, the feed stream is switched and the gel bed is desorbed.

Sun's new process will employ two desorbents. The first introduced to the saturated gel bed is butane, termed desorbent "B." This stream serves to displace, or wash the bed free of, the nonadsorbed hydrocarbons, termed the saturates. Butane is then followed by desorbent "A," which comprises mixed xylenes. These by virture of their high volumetric ratio to the benzene and toluene, displace the lighter aromatics from the silica gel bed. The xylene stream is charged until all benzene and toluene are displaced from the gel case. This completes the cycle.

The steps involved in the selective adsorption and desorption process are shown schematically in Fig. 1. Stage 1 shows the gel bed completely occupied by mixed xylenes which are adsorbed on the silica gel and also comprise the liquid phase. Stage 2 shows the introduction of aromatic-rich reformate. The benzene and toluene fractions are displacing xylenes in the adsorbed phase, and the nonaromatic or saturate hydrocarbons occupy the liquid phase.

When the gel bed's capacity for adsorbing benzene and toluene is reached, butane is introduced, and its

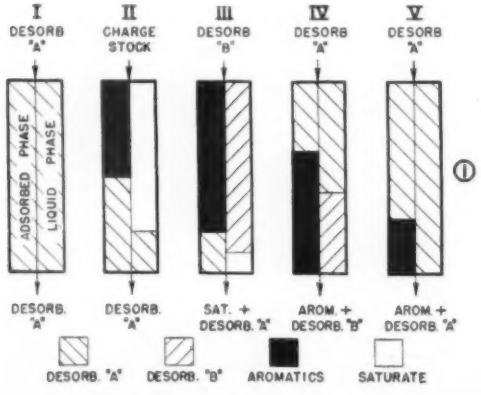


Fig. 1.

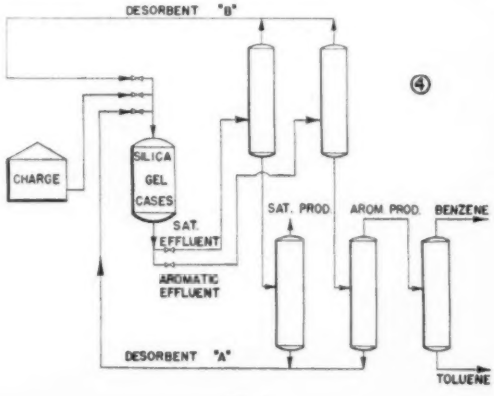


Fig. 4.

displacement of saturates in the liquid phase is depicted in Stage 3. Stages 4 and 5 show graphically the displacement of both the adsorbed aromatics and the butane by the xylenes.

Throughout the cycle, the rate of flow through the gel case is continuous. The variation in effluent composition is shown graphically by the phase diagram, Fig. 2. The cycle begins with the first appearance in the effluent of the nonaromatic saturates and ends with the displacement of the last trace of aromatics by desorbent "A." A measure of the relative composition of the effluent stream is provided by the refractive index of that stream, which index is plotted against the same cycle time in Fig. 3.

Switching.—This index is employed in the commercial unit in switching the effluent stream from one recovery system to another. Fig. 4 is a flow diagram of the process as it will be employed in the Sun installation.

Although the commercial unit will comprise six gel cases, only one is shown for simplicity. The charge stock and the two desorbents enter the top of the case in proper sequence through the inlet manifold. The effluent stream is alternately switched between two recovery systems.

When the effluent comprises mixed saturates and desorbents, the stream charges to two distillation columns in the saturate-recovery system. In the first column, butane, or desorbent "B," is withdrawn overhead for recycle. The bottoms fraction charges to the second fractionator where the nonaromatic saturates are withdrawn from the unit, and the bottoms comprising the xylene desorbent "A" is recycled.

When benzene and toluene appear in the effluent, the stream is switched to a similar bank of two fractionators. In addition, a third column splits the mixed light aromatic stream into benzene and toluene.

The cyclic operation of the gel cases is automatically controlled. A meter in the effluent line from each case controls the flow rate at any desired level. This permits the quantity of charge and of both desorbents to be controlled entirely by a cycle timer which switches the streams on all six cases. Cycles in the six cases are staggered to maintain substantially a uniform flow to the recovery systems.

The switching of the effluent stream from each case will be controlled by an instrument which is sensitive to a property of the mixed-hydrocarbons stream. While Sun engineers did not reveal which property they would select, it is known to be a function of the refractive index, which, as shown in Fig. 3, clearly marks the appearance of the light aromatics in the stream leaving the gel bed.

Operating data.—A complete cycle for each case in the Sun installation will require about 100 minutes, allowing about 15 cycles per case per day.

The silica gel cases for the Sun unit will measure 10 ft. in diameter and 20 ft. in height and will contain a total of about 500,000 lb. of gel. Pilot-plant studies indicate that gel life will be about 1 year. Gel will be discarded and replaced with fresh material in one case at a time without interrupting the operation of the unit.

Regenerative pretreatment driers will be installed on each of the feed streams to protect the gel from moisture and other poisons. The unit will operate at a constant temperature of about 100° F., and at a low pressure sufficient only to prevent butane vaporization. Thus the displacement by xylenes of benzene and toluene from the adsorbed phase during desorption, and the reversed displacement of the xylenes by the lighter aromatics during the adsorption stage, requires no change in temperature.

These reserved displacements are brought about by the relative volumes of the two aromatic streams flooding the gel beds. About 2 bbl. of desorbent "A" and 0.5 bbl. of desorbent "B" will be required per barrel of charge. However, four-fifths of the desorbent is taken as a bottoms products and need not be distilled. These ratios apply to operations on a charge containing 35 per cent aromatics. The ratio of desorbents to charge would be greater for a richer aromatic charge and smaller for a charge leaner in aromatics.

For this operation, xylenes must be stripped from the fresh charge stream to the unit. Other feed streams and other desorbents may be employed in the process for concentration of other aromatics, so long as the desorbents show sufficient boiling-point differences to permit efficient stripping.

High recovery. — Under all circumstances, say Sun engineers, the recovery of available aromatics is high. But, as shown in the following table, the recovery is diminished somewhat when high purity is desired:

Per cent purity	Per cent recovery
98	90
96	94
94	96
90	98

Specification benzene and toluene will be produced with the requirement of only a light sulfuric acid treatment, to meet the acid-wash specification. This treatment is required because a small percentage of olefins will be produced with the aromatic fractions. Although catalytic reformates are essentially free of olefin compounds, they may contain as much as 2 per cent of these unsaturated hydrocarbons. Most are rejected with the nonaromatic or saturate product, but when the charge contains as much as 2 per cent olefins, the aromatic product may contain about 0.5 per cent.

Plant costs.—Sun reports that investment and operating costs of an Arosorber will vary with the size of the unit, the desired purity of the product, the aromatic content of the feed, the way the plant is integrated with other facilities, and other factors.

However, the following table gives typical figures which include reasonable allowances for overhead, taxes, maintenance, 10-year depreciation, etc.

Capacity, bbl. per day aromatics	1,000	2,000
Investment cost	$1,200,000	$1,900,000
Operating cost, cents per gal. aromatics	6½	5

Both Houdry Process Corp. and Universal Oil Products Co. have been appointed as agents authorized to license the Arosorb process under patent rights held by Sun Oil Co.

Industry Briefs

WASHINGTON.—Ralph L. Miller, since 1948 chief of the Navy oil unit of the Alaskan and foreign branch of the Geological Survey, has been designated chief of the survey's fuels branch. In his past assignments for the survey, Miller has made studies of the oil geology of the southern Appalachians and the geology and oil resources of the Arctic slope of Alaska.

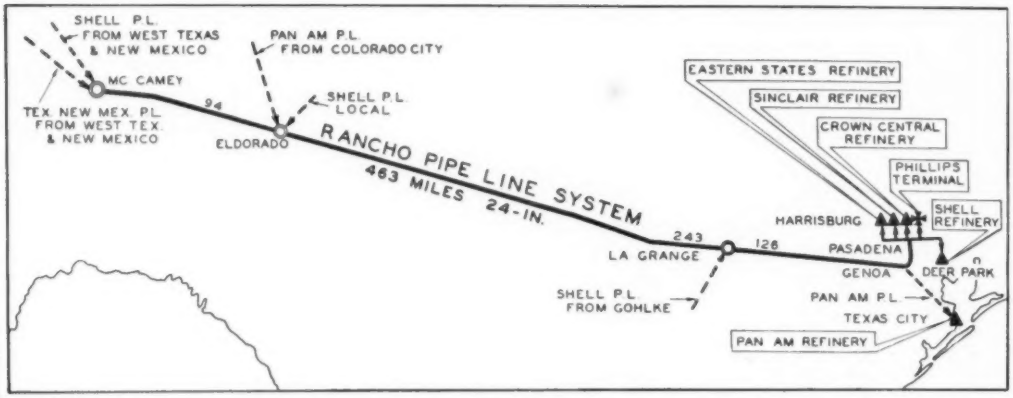
WASHINGTON. — The Walter bill returning ownership of the tidelands to the states has been sent to the floor of the House for vote, with a favorable report by the judiciary committee.

LOS ANGELES.—Mrs. Suzanna B. Grimes, royalty owner under the Grimes lease of Coalinga Nose field, near Fresno, has filed suit for $150,000 against seven oil companies and one individual for royalties she alleges are due her. Her suit says she has been receiving $360 a month instead of $3,000 due her.

NEW YORK.—Gulf Oil Corp. has ordered a new 18,000-ton tanker for coastwise service. The ship will have a capacity of about 150,000 bbl. of products and will bring Gulf's ocean-going tanker fleet up to a total of 38 ships.

BATON ROUGE.—A new petroleum map of Louisiana has been issued by the state Conservation Commission. It shows oil and gas deposits, pipe lines, refineries, natural-gasoline plants, and cycling operations, and also outlines fields in the disputed tidelands area.

BEEVILLE, Tex.—Stanolind Oil & Gas Co. this week moved its Woodsboro area offices to Beeville. The office handles production operations in 31 fields and 11 counties in South Texas.



NEW CRUDE LINE.—This is the route of the proposed Rancho Pipe Line System, a 24-in. crude carrier from West Texas to the Houston refining center.

New Crude Line Planned

Six companies join in project to move West Texas oil to Houston area to meet refinery-expansion requirements

HOUSTON.—A 24-in. crude-oil pipe line will bring West Texas oil a distance of 463 miles into the Houston-Texas City refining area if materials are allocated by Petroleum Administration for Defense.

The proposed $35,000,000 line, known as the Rancho Pipe Line System, is a multiple-ownership project with six companies participating and will originate at McCamey, in the Permian basin.

Three pumping stations will give the line an initial capacity of 209,000 bbl. per day. This capacity will be increased to 315,000 bbl. per day when the number of pumping stations is eventually increased to eight.

The Rancho line is expected to furnish much of the additional feed stock required for the current refinery-expansion program. Practically every processing plant in the near vicinity of Houston and Texas City has an expansion program planned or under way.

Any crude not immediately required for refining in this area could be shipped by water from the Port of Houston. During 1950 the port handled more than 31,000,000 short tons of petroleum products.

Owners.—The Rancho line will be designed, constructed, and operated by Shell Pipe Line Corp. Other participants are Sinclair Pipe Line Co., Pan American Pipe Line Co., Phillips Pipe Line Co., Nantucket Pipe Line Co. (a wholly owned subsidiary of Eastern States Petroleum Corp., Inc.), and Tidewater Pipe Line Co. (a wholly owned subsidiary of Crown Central Petroleum Corp.).

Route and connections.—From McCamey the line will run via Eldorado, LaGrange, and Genoa into Pasadena, Harrisburg, and Deer Park. Plans call for receipt of oil from owners' connecting lines at McCamey, Eldorado, and LaGrange.

At Genoa the Rancho will connect to a line terminating at Texas City, and between Harrisburg and Deer Park it will connect with the refineries or terminals of Eastern States, Sinclair, Phillips, Crown Central, and Shell.

Fields which will feed the line have not been identified, but two of the companies, Shell and Pan American, have existing lines to serve Permian basin and Scurry reef fields. Shell has a line from West Texas and New Mexico which will connect with the Rancho system at McCamey. Pan American's line from Colorado City will connect at Eldorado along with a Shell local system.

Also at McCamey, Texas & New Mexico Pipe Line Co.'s West Texas and New Mexico line will join the new system.

At LaGrange, Shell will connect a pipe line serving Helen Gohlke field in South Texas.

In addition, Phillips has a crude pipe line presently authorized for Midland, Glasscock, Reagan, and Upton counties which might connect to the Rancho line.

Pump stations will be electrically powered, and each will contain three 1,750-hp. and one 900-hp. pumping units with auxiliaries. A large tank farm at McCamey is planned.

Application for materials allocations have been filed with PAD. Construction is expected to start immediately after approval is obtained. Completion is scheduled tentatively for 1952.

Imports Unchanged

Drop in products offsets gain registered by crude

TOTAL imports into continental United States averaged 875,000 bbl. daily in May, according to data released by the Department of Commerce. This represented a decrease of only 5,000 bbl. daily from the April average with the reduction in product imports almost offset by the gain for crude.

Crude imports gained 12,000 bbl. daily to 517,000 bbl. daily. Receipts from Venezuela were up 35,000 bbl. daily. A small decrease was reported for Mexican crude, and imports from Colombia dropped 19,000 bbl. daily from the abnormally high average in April. Oil from the Middle East averaged 119,000 bbl. daily compared with 116,000 bbl. daily in April.

Total exports, excluding shipments to territories averaged 372,000 bbl. daily for an increase of 29,000 bbl. daily over April. Changes in imports during the month were more important than the net increase would indicate since the net gain was made up from a crude loss of 63,000 bbl. daily and a jump in product exports amounting to 92,000 bbl. daily.

The big gain in product shipments was due to heavy export sales during the first partial shutdown of the Abadan refinery. The greatest increase was reported for residual, up

54,000 bbl. daily. Distillate fuel increased 16,000 bbl. daily, and kerosine gained 15,000 bbl. daily.

IMPORTS INTO CONTINENTAL UNITED STATES
(Thousands of barrels)

	May 1951	April 1951	May 1950
Crude—			
Mexico	856	871	912
Colombia	1,279	1,818	1,646
Venezuela	9,964	8,578	7,928
Kuwait	1,561	1,708	2,226
Saudi Arabia	2,028	1,852	1,126
Other	331	314	.....
Total crude	16,019	15,141	13,838
Daily average	517	505	446
Products—			
Residual fuel	9,768	10,377	9,302
Other products	1,329	839	833
Total products	11,097	11,216	10,135
Daily average	358	374	327
Total all oils	27,116	26,357	23,973
Daily average	875	879	773

EXPORTS*
(Thousands of barrels)

	May 1951	April 1951	May 1950
Crude	1,791	3,615	2,946
Gasoline	2,236	1,967	1,844
Kerosine	666	185	71
Distillate fuel	1,866	1,335	691
Residual fuel	2,679	982	861
Lube oils	1,478	1,344	1,160
Other products	830	856	512
Total all oils	11,546	10,284	8,085
Daily average	372	343	261

*Excludes shipments to territories.

WEST COAST

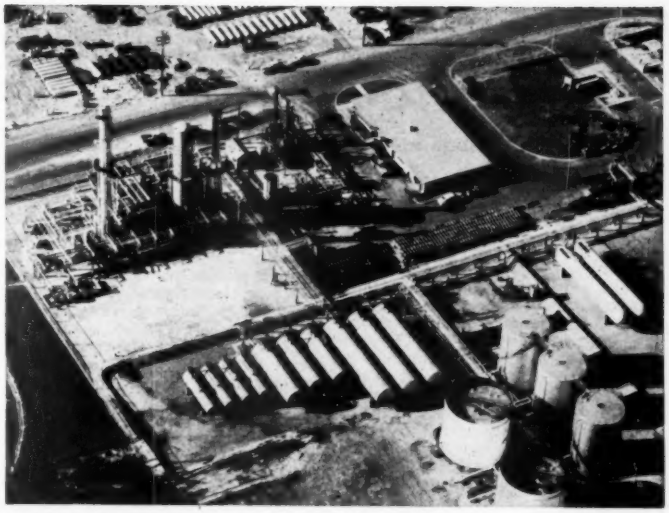
Asphalts Added

Honolulu plant now making paving, roofing materials

OUTPUT of the 3,000-bbl. per day refinery recently completed at Honolulu by Pacific Refiners, Ltd., has been expanded to include a full line of paving asphalts and oxidized asphalts. Laboratory work is under way on the objective of manufacture of a protective coating, and the company has assumed the refining, storage, and distribution of benzene, toluene and xylenes available as byproducts from the cracking of gas oil for producing manufactured gas.

The new refinery does not charge whole crude. Under a 10-year contract with Standard Oil Co. of California the company purchases a blend of reduced crude and butane, shipped in by tanker from West Coast refineries. *(The Oil and Gas Journal, March 30, 1950, page 132.)* From this charge, the plant produces about 52 per cent gas oil, 42 per cent asphalt, and 6 per cent L.P.G. The gas oil is sold to Honolulu Gas Co., Ltd., which cracks it in a high B.t.u. process to produce manufactured gas for the city of Honolulu.

Aromatic byproducts of the cracking process are recovered in a typical absorber using a light gas oil for a lean oil. The lean oil is then stripped.



***HAWAIIAN OPERATION.**—Aerial view of the Honolulu refinery of Pacific Refiners, Ltd., which charges a blend of reduced crude and butane.*

and benzene of 97 per cent purity is recovered. These aromatics are returned to Pacific Refiners for possible further refining, storage, and sale. Most of the benzene is going to Stauffer Chemical Co. of Los Angeles and is shipped back to the Pacific Coast. The first shipment of approximately 300,000 gal. recently arrived at Los Angeles. Toluene and xylenes are not yet fully contracted.

Asphalts.—Asphalt products of the new plant are distributed throughout the islands in specially designed insulated containers each of which keeps 5 tons of asphalt at usable heat for a period of 1 week.

L.P.G. is finding a ready market in the territory, the principal one being the city of Hilo, which is served entirely by this product, as an L.P.G.-air mixture handled in a central distribution system.

First asphalt was produced at the plant on August 30, 1950, from a straight reduced crude. Butane was later blended with the charge and the first L.P.G. was produced 2 months later. Since initial operations, airblowing facilities have been added to the asphalt plant. The new company is headed by E. E. Black. A. E. Englebright is vice president and general manager, J. Howard Worrall is vice president, and P. G. Curnutte is refinery superintendent.

Macoil Purchase Under Way

LOS ANGELES.—J. R. Pemberton, Los Angeles geologist, has offered to purchase the stock of Macoil Corp., which has production in California and Texas.

Pemberton's offer was for $6.89 a share, provided he could buy a minimum of 70 per cent of the company's 401,980 shares by August 4.

Macoil's production is about 1,000 bbl. daily. It also has undeveloped properties in Texas, Wyoming, and Alberta.

Gas Line Progressing

LOS ANGELES.—Southern California Gas Co. in early September will complete the final leg of its 30-in. distribution loop around the edge of metropolitan Los Angeles.

The final project, about one-fourth completed, involves laying 25 miles of 30-in. line from Southwest Los Angeles northward into San Fernando Valley to a point near Burbank. Previously legs had been laid in eastern Los Angeles and along the southern portion to a point where the current project was started.

ROCKY MOUNTAIN

New Williston Discovery?

WILLISTON, N. D.—Another oil-producing area for the Williston basin has been indicated at Shell Oil Co. 1 Northern Pacific Railroad, 19-23n-50e, Dawson County, Montana.

Shell's wildcat, located about 80 miles northwest of the nearest Upper Cretaceous gas production on the Cedar Creek anticline of extreme southeastern Montana, is reported to have flowed 38°-gravity oil at a rate of 1,000 bbl. daily on a drill-stem test of the Mississippian-Madison at 7,253-7,390 ft.

SPECIAL REPORT

Foreign Steel Setup

Mobilizer Wilson describes basic policy for distributing tubular goods to vital American overseas oil operations

Bertram F. Linz

WASHINGTON. — Estimates of the National Petroleum Council steel committee last September that foreign operations of American oil companies would require 161,500 tons of oil-country tubular goods in 1951 have been ratified by the Government.

A quota of 13,333 tons of oil-country tubular goods and 352,000 tons of drill pipe has been approved for July, with about the same amounts fixed as quotas for August and September.

The actual distribution of materials is handled by the foreign division of the Petroleum Administration for Defense, but the fixing of quotas is a matter in which a number of agencies participate.

C. S. SNODGRASS

Since the United States currently is importing close to 1,000,000 bbl. of foreign oil daily and Europe, dependent on the Middle East, would have to look to this country in the event that supply was cut off, it is considered vital that the overseas operations of American companies be supported.

Foreign operations vital.—To that end, continued development of presently producing foreign properties and expansion of production where it is strategically most valuable are the aims of the division.

The allocation of tubular goods and drill pipe, if maintained at that level, would run approximately 167,000 tons a year, but actual quotas probably will not vary materially from the 161,500 tons estimated by the NPC committee. Allocations are based on a program for the drilling of 2,400 wells in foreign countries which this year are estimated will have a daily production of approximately 4,500,000 bbl.

Canada, whose operators are given the same priority privileges as are domestic producers, receives a separate allocation of 13,200 tons of casing, tubing, and drill pipe for the third quarter, based on a program for the drilling this year of 700 wells. Canadian production for 1951 is expected to average around 125,000 bbl. daily.

Organization.—The PAD foreign division is headed by Assistant Deputy Administrator C. Stribling Snodgrass, who served in top posts in the foreign division of the Petroleum Administration for War between 1941 and 1946 and then joined Bechtel Corp. as vice president. He left the company last February to join PAD.

All three branches of the division now have been set up. George Ballou, formerly executive assistant in New York for the Calmara Oil Co., a subsidiary of Standard Oil Co. of California, is serving as director of foreign refining. William H. Farrand, since 1948 general manager of the foreign-production department of The Texas Co., is director of foreign production; and John A. Walstrom, vice president of Asiatic Petroleum Corp., was chosen recently to head up the foreign supply and transportation division.

The development of policy for the support of foreign operations is a complex matter differing greatly from that of laying down a program for domestic operations. Because of the strategic, political, military, and economic factors involved, it is a mattter in which the PAD division must work with the State, Defense, and Commerce departments, the Economic Cooperation Administration, and other agencies, as well as the National Production Authority from which PAD derives its powers.

All agencies interested in foreign oil are represented on a foreign-petroleum committee which PAD supplies with information on the physical factors of the foreign oil industry. It is responsible for the coordination of the policies and views of the military, diplomatic, and other interests to arrive at an integrated program.

After the policies to be followed are developed, the actual allocations of materials for operations abroad are determined by a foreign petroleum-materials committee, also an interagency body. It was this committee that set the amounts of tubular goods and drill pipe to be exported during the third quarter.

After the amount of material to be exported is decided upon, it is the job of the foreign division to parcel it out among the companies. Currently, the division is dealing with the companies on an individual basis, but it plans to work out a program for at least one quarter ahead and prepare forms on which the companies will furnish information regarding their detailed projects, requirements, and inventories.

Under the system, the granting of an allocation will be accompanied by the necessary export license, thereby reducing the red tape necessary to move material abroad.

Data required. — Data required from the companies includes information on inventory. While the division will not permit excessive inventories to be carried abroad, it has been impossible to lay down any general regulation applicable to all areas. The controlling factors will be the distance of the operation from the source of supply and the time required to secure deliveries.

An operator in the United States needs only an inventory of a couple of weeks' needs, for he is right up against his source of supply. An operation in Venezuela may require a 3-months inventory, because of the longer time required for delivery, and a project in the Middle East might need a 6-months inventory for the same reason.

The same factors — strategic, military, etc.—that are involved in the determination of policy dictate the distribution of export quotas.

The Middle East is a major source of supply for Europe and the current situation in Iran emphasizes the strategic desirability of maintaining a strong hold on that area. Washington officials, therefore, find it highly desirable that material for continued operations in that area be provided.

Latin American oil secure. — On the other hand, from the military point of view, Latin American production is more secure, and the policy of supporting a growing Latin American economy also indicates the desirability of encouraging expansion of production. This policy has been pointed up by the constant efforts that have been made to secure the adoption of laws in Brazil, Peru, and other countries that will provide the same favorable atmosphere for development by United States companies that is enjoyed in Venezuela.

One of the first assignments given Farrand, as head of the producing branch of the foreign division, is that of making an exhaustive study of the whole Latin American oil situation. Special emphasis will be placed upon Venezuela, which is now the most promising area for increased production, and on which we will have to draw more heavily for supplies.

Over the months to come, increasing emphasis is expected to be placed on the development of Latin American oil, and it will figure extensively in a long-range program the division is now working out. Such a program must include alternatives designed to cope with any change in the international situation such, for instance, as an interruption of supply from Iran,

and those alternatives of necessity must lean heavily on Latin America.

Canadian importance. — From the standpoint of security, Canada is second only to the United States itself, and while the allocation of material so far made for that country is substantially less than was requested and considerably below the amount which could definitely be used, it is believed adequate for a start toward materially expanded production.

The basic policy on the supply of scarce materials to other countries was laid down by Defense Mobilization Director Charles E. Wilson with a warning that producers who may be reluctant to accept orders for export may be required by the Government to take them.

The allocation of scarce materials to foreign needs, Wilson said, is to be predicated on their contribution to the military production of the free world, the promotion of increased supplies of materials required for the mobilization program; the maintenance and necessary expansion of essential production facilities and maintenance of minimum essential civilian consumption requirements in the free nations. It will also depend on direct progress toward reduced future dependence upon assistance from the United States; lessened dependence of the free nations upon supplies from areas or countries within the Soviet bloc, and the prevention of political deterioration in nations or areas essential to the combined strength of the free world.

NATIONAL AFFAIRS

How to Replace Iran

Policy heads want to fill gap to convince Iran it isn't indispensable, but they're touchy about shortages here

WASHINGTON. — Top policy-making officials of the government are pondering the extent to which the United States can dip into its own oil resources to help fill the void in world supplies created by the loss of Iranian petroleum.

They are hoping for an early truce in Korea, since the resulting drop in demand for Far East operations would ease the strain imposed by the Iranian situation, but planning is being carried on on the basis of a possible indefinite continuation of hostilities.

The important thing that colors all thinking is that available world supplies must be so distributed that the government of Iran—or any other foreign government with indigenous oil resources—will not be able to claim that the loss of its oil could create a stringency in other parts of the world.

What is needed.—A number of important questions are involved in any program to supply markets which formerly depended upon Iran, centering around the provision of crude, residual fuel oil, kerosine, and aviation gasoline for commercial air lines. Some of these questions are expected to be answered this week in a report from the Foreign Petroleum Supply Committee on what will be required to meet the situation and the call upon United States for supplies.

Meanwhile, W. Averell Harriman, President Truman's top foreign-policy adviser, is in Iran this week to discuss the problem with Prime Minister Mossadegh. Reportedly, however, Harriman did not carry any concrete formula with him for settling Iran's controversy with Britain and is expected to seek merely to create an atmosphere favorable to new negotiations with the Anglo-Iranian Oil Co. if it is not too late. *(See International.)*

The supply which must be made up to replace Iranian oil is estimated to include about 200,000 bbl. daily of crude, 18,000 bbl. of aviation gasoline and around 90,000 bbl. of other gasoline, 250,000 bbl. or more of residual, and a considerable volume of kerosine.

Already there are threats of an aviation gasoline shortage in some of the areas formerly serviced by Anglo-Iranian Oil Co., and the need for kerosine for India, Pakistan, and other parts of Asia and Africa is acute.

Effect on U. S.—How this situation will affect the domestic industry is the big question. Over a short period production in the Persian Gulf area can be stepped up substantially, but there is not much crude available in Venezuela above present production and the assumption is that the remainder will be made up by diversion of some of the oil now coming from the Middle East to the United States.

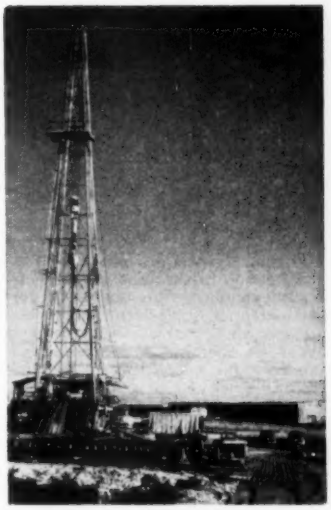
To offset this loss of imports it would be necessary to increase domestic production and, as things stand now, the major source of additional supply would be West Texas. That area, however, is short of transportation facilities, which means that railroad tank cars would have to be resorted to on a rather large scale.

With respect to refining capacity to offset the loss of the Abadan plant and its more than 500,000 bbl. daily, it is estimated that there is some excess capacity in Europe, possibly around 200,000 bbl. daily, and that output in Aruba and Curacao could be pushed up slightly, although those plants now are working at around capacity.

In products, therefore, the United States again would have to make a substantial contribution, which poses serious problems with respect to aviation gasoline, residual fuel oil and kerosine.

This, then, is the over-all problem which must be worked out in such a way as not to precipitate rationing or other restrictions on gasoline or home heating oils in this country.

Such a move would be politically very unwise, for the New England congressional delegations are very sensitive to the supply situation, particularly in the case of kerosine



Two-State Field?

Production from Louisiana's Phoenix Lake field is believed to have been extended into Texas by this well of Ohio Oil Co., the I Lutcher-Moore Lumber Co. on the west bank of the Sabine River. The field has eight producers on the Louisiana side. The well pictured here, which flowed at a rate of 284 bbl. daily on a potential test, is 1½ miles from Phoenix Lake production. In the background can be seen shrimp boats at the city dock of Orange, Tex.

Escalator-Clause Warning

WASHINGTON. — Price Stabilization officials are warning wholesale suppliers of petroleum products that escalator clauses in their contracts

with customers will not be recognized under Ceiling Price Regulation 17.

This regulation, in general, sets ceiling prices at the highest price charged by the seller to each class of purchasers during the December 9-January 25 base period.

The contracts involved are those based on a price to be governed by current quotations in a recognized trade publication.

"Where a supplier made a contract with a purchaser based on the current low quoted price in a recognized trade publication in the base period," officials explained, "any change in such quoted price subsequent to the base period would not authorize the supplier to increase his ceiling price above his established base-period ceiling price.

"The supplier is frozen to the price charged in the base period and no escalation in the ceiling price can occur notwithstanding the terms of the contract, if supplier's ceiling price to purchasers of the same class is determined by the contract."

More Studies

New oil, gas problems may be tossed in lap of NPC

WASHINGTON.—New requests for oil studies are expected to be submitted by the Interior Department at the summer meeting of the National Petroleum Council next week.

Among other things not yet disclosed, department officials may ask the council to make a study of the natural-gas production situation as related to the proposed restrictions on expansion of service to consumers in most of the area east of the Mississippi River.

Studies may also be requested of problems created by the loss of Iranian oil supplies. The Iranian situation has been a major subject of discussion in all government oil circles for weeks and is almost certain to figure in the proceedings of the council, which is to be addressed by Secretary Oscar L. Chapman.

Although a number of committees have been actively at work since the last council meeting in May on projects assigned by the department, few of them have pushed their studies to the point where they will submit anything more than progress or interim reports next week.

One exception may be a committee on petroleum availability, which is expected to have a report on the near-term situation but has not completed its survey of long-term prospects. The committee studying the quebracho situation may have a report on possible substitutes for the mud component from South America, which is equally important as a tanning agent of the leather industry.

Another possibility is a report on

WATCHING WASHINGTON

Bertram F. Linz

Sulfur Pool

Because of the very serious world shortage of sulfur, 11 nations have agreed to pool and allocate the available supply and have already made firm allotments for the current quarter.

The 11 countries are members of the International Materials Conference which has been studying the sulfur situation. The conference found that the supply available for third-quarter consumption would be 1,415,400 long tons of which 1,300,000 tons would be in the United States and Canada, 63,700 tons in Italy, and 24,900 tons in Norway. The United States, Italy, and Norway are the only countries which have sulfur for export and have been given export quotas of 250 000, 17,700, and 18,700 tons, respectively.

Under the allocation schedule, the United States and Canada will have a total availability of 1,050,000 tons of sulfur for their oil and other sulfur-consuming industries. Specific allocations are set up for 20 other countries, and a separate allocation of 8,500 tons is provided for the oil refineries in Bahrein, Lebanon, Netherlands West Indies, Trinidad, Indonesia, and Iran.

This is the only allocation made for a specific industry, and the distribution of the United States supply is left to the Government, in this case the National Production Authority.

Rubber Stretcher

Recent developments in the mixing of emulsified petroleum oils with synthetic rubber may be a factor in stretching the United States rubber supply.

Four methods for obtaining a greater amount of rubber from a given amount of butadiene and styrene are currently under test. These oil-GR-S mixtures are claimed to stretch the rubber hydrocarbon supply with no loss in properties insofar as tire performance is concerned and, in fact, to give an increase of from 6 to 27 per cent in tire mileage.

The new rubbers may be important in plans now under consideration by the Office of Rubber Reserve to increase GR-S capacity from the present 756,000 tons to around 860,000 tons.

An increase of this magnitude, it is said, can be achieved without the construction of new plants by additions to existing facilities and the removal of bottlenecks.

With the alcohol-butadiene plants running at full capacity, 16,000 to 18,000 short tons of butadiene may be made available, and another 40,000 tons or more may be secured from existing petroleum plants by use of a new catalyst claimed to be 20 to 25 per cent more efficient than present catalysts. It has been estimated that an additional 100,000 tons of capacity can be installed at a cost of not exceeding $5,000,000.

Involved Proposition

Government control of materials is a pretty involved proposition.

The Controlled-Materials Plan which went into effect July 1 is designed, for the present a least, to regulate the distribution of only three metals—steel, copper, and aluminum—but the National Production Authority's list of products using them runs to some 4,000 items.

The list of items of oil-field machinery and tools for which manufacturers must apply to PAD for material alone runs to 63 products.

With many materials under M-order controls and more to be added as time goes on, the NPA has drawn up a list of approximately 11,500 products running from abaca cable to zithers which come within its jurisdiction.

Copper Shortage Serious

The copper situation is, if anything, even more serious than is the steel situation.

A recent strike in Chile cut imports by 50 per cent and a later strike in Utah cut the domestic supply by one-third. To add to the difficulties of importers, the German electrical industry has made deals for a considerable volume of Chilean copper in return for manufactured products, taking metal which the United States could use.

As a result of the curtailed supply, Defense Production Administration officials are talking about a 50 per cent slash across the board in fourth-quarter copper allocations for all but direct defense programs.

Fourth-quarter copper requirements for the oil and gas industry have been set by PAD at 24,884,000 lb. This is only a fraction of the more than 1,000,000,000 lb. which would normally be available.

the supply situation, but final reports are not expected on other investigations which include costs of producing synthetic liquid fuels, the cost in material and money of an additional 1,000,000 bbl. daily of oil products, underground storage and trends in consumer equipment.

Defense Orders Issued

WASHINGTON.—The following orders have been issued by the National Production Authority:

M-75, July 6: Limiting the use of steel drums and controlling inventories.

Amendment to M-1, July 6: Revising set-aside percentages to be observed by steel producers.

Amendment to M-70, July 6: Extending the MRO provisions of the Controlled-Materials Plan to water-transportation systems.

Amendment to M-5, July 6: Bringing regulations on aluminum into conformity with the Controlled-Materials Plan.

CMP Regulation 5, July 6: Providing for the acquisition of MRO supplies by manufacturers.

CMP Regulation 7, July 6: Providing for the acquisition of parts and materials needed by repair shops.

Amendment to Delegation 14, July 11: Extending to PAD and certain other agencies authority to make allotments of controlled materials and apply ratings and allotment symbols for construction of industry facilities.

More Plants Authorized

WASHINGTON.—Issuance of an additional 26 certificates for accelerated amortization of new facilities in the oil industry has been announced by the Defense Production Administration.

The largest certificate issued during the week ended July 6 calls for quick write-off of 55 per cent of a $6,014,416 plant to be built by Phillips Petroleum Co. in Sherman County, Texas, for natural-gasoline production. Another natural-gasoline plant is covered by a certificate for 70 per cent of $4,544,000 to be invested by Shell Oil Co. in Bechman County, Oklahoma.

Three certificates issued to Socony-Vacuum Oil Co. provide for accelerated amortization of 55 per cent for a $4,588,000 facility at Buffalo, N. Y., for motor gasoline, and a $4,640,000 plant at Brooklyn for butanes, and 65 per cent for a $4,610,000 plant for butane at East Chicago, Ind.

Other certificates went to the Humble Oil & Refining Co., for 100 per cent of a $64,941 project for toluene and xylene at Baytown, Tex.; Union Oil Co. of California for 70 per cent of a $1,000,000 asphalt plant at Edmonds, Wash.; American Oil Co. (Md.) for 50 per cent of $68,000 of a $114,500 project for gasoline at Salisbury, Md., and $73,600 for gasoline at South Norfolk, Va.; Gulf Oil Corp. for 75 per cent of a $606,486 natural-gasoline and butane project at Pittsburgh; McKamie Gas Cleaning Co. for 75 per cent of a $1,772,483 butane plant at Magnolia, Ark.; and Crown Central Petroleum Corp. for 70 per cent of a $265,000 project for ethylene and propane-propylene at Pasadena, Tex.

Transportation, storage.—A number of certificates were issued for oil transportation and storage, including one to Phillips Petroleum Co., Bartlesville, Okla., for 50 per cent of a $241,460 pipe line.

Other certificates in this group went to Shell Oil Co., for 50 per cent of $455,350 of a $520,000 project for storage at Searsport, Me.; Delta Barge Co., New Orleans, for 80 per cent of $124,050 for oil-barge transportation; Thomas Hickey Coal & Oil Co., for 50 per cent of $14,670 for heating oil storage at Wakefield, Mass.; Martin Oil Service, Inc., for 50 per cent of $141,039 for storage at Blue Island, Ill.; Webber Tanks, Inc., for 50 per cent of $151,041 for storage at Bangor, Me.; Newbay Oil Terminal, Inc., for 75 per cent of $650,000 for storage at Port Newark, N. J.; The Neville Co. for 50 per cent of $262,203 for fuel oil storage at Neville Island, Pa.; Pocahontas Terminal Corp., for 50 per cent of $1,400,000 of $1,600,000 for storage at South Portland, Me.; Gulf Oil Corp. for 50 per cent of $295,195 for fuel-oil storage at Chelsea, Mass.; Shell Oil Co. for 50 per cent of $622,986 of $724,829 for a barge terminal at Bedford Park, Ill.; Smith Oil & Refining Co. for 50 per cent of $84,267 for tank storage at Fulton and Peru, Ill.; and Jackson-Hope Towing Co., Mobile, Ala., for 80 per cent of $94,215 for oil-barge transportation.

Steel Shortage

Last 4 months to see serious lack of structural shapes; oil industry construction to be curtailed, DPA says

WASHINGTON.—A serious shortage of structural steel is forecast by Defense Production Administration officials for the last 4 months of this year.

Preliminary fourth-quarter requirements for structural-steel shapes submitted so far by claimants are almost 1,100,000 tons above the estimated production for the quarter of 1,300,000 tons.

Officials indicated that nondefense construction and production will be sharply limited to provide supplies needed for defense production facilities, freight cars, etc.

The preliminary estimates show a need for 65,000 tons of structural steel for oil and gas construction and 33,000 tons for oil-field machinery and equipment. These programs, DPA said, will have to be curtailed below the preliminary figures as supply and demand are brought into balance.

The National Production Authority, meanwhile, has strengthened its control over steel, copper, and aluminum.

CMP amended.—The Controlled Materials Plan regulations have been amended "to make it unmistakably clear" that manufacturers and others who receive authorized production schedules and allotments of controlled materials may not purchase materials of any kind to augment their output of items for which allotments have been made.

Application forms for fourth-quarter allotments of the controlled metals have been mailed to manufacturers, who must state all requirements for steel, copper, and aluminum to be used during the quarter and their anticipated requirements for the first three quarters of 1952.

Another NPA order will practically eliminate the free market in steel by changing the base period on which producers must figure their set-aside percentages for alloy steel from the first 8 months of 1950 to "planned monthly production" and sharply increasing the set-aside.

In the case of oil-country goods—carbon steel, including high-strength low-alloy—the set-aside is placed at 110 per cent of average monthly shipments for the first 8 months of last year. The set-aside of line pipe remains at 35 per cent but this does not mean there will be any "free" pipe since programed requirements will absorb the remainder.

Limitations upon the use of new and used steel drums and on inventories also have been imposed by NPA, under which the use of drums is prohibited for the shipment of crude oil except laboratory samples.

Other changes.—The authority of PAD and certain other agencies to process applications for permission to commence construction has been extended to permit them to operate under the controlled-materials plan. The expanded delegation will enable PAD to authorize construction schedules and make allotments of controlled materials for construction and apply ratings and allotments for facilities for the production, processing, refining, and distribution of petroleum and gas.

Revision of the basic construction order is under consideration in NPA under which industrial construction projects using not more than 25 tons of steel, 2,000 lb. of copper or 1,000 lb. of aluminum could go ahead with NPA certification for use, self-certification only being required to obtain the materials.

Tank-Car Output Estimated

WASHINGTON.—Tank-car production during the final quarter of this year now is expected by National Production Authority experts not to exceed 2,500 units.

Added to an anticipated 26,000 freight cars, this will give a total

railroad-car production for the quarter of around 28,500 units, which is as close to the programmed target of 10,000 cars a month as steel supplies will permit.

The latest figures on freight and tank-car production available show that after rising steadily from February through May, when a peak of 9,744 units was reached, production fell off in June to 9,644. However, NPA officials said, steel supplies for the third quarter are expected to be sufficient to permit output to continue near the 10,000-a-month level through September.

Present production is close to the capacity of the car-building industry but any further expansion would be limited by the lack of steel. Freight-car building, it was explained, takes large quantities of wide steel plate, which is in short supply. Steel bars and alloy steel, also extensively used, are likewise exceedingly short. Since substitutions for these materials are impossible in most cases, production of cars will have to be geared to available supplies of steel.

Because of the production techniques of the industry, there is usually a 90-day lag between deliveries of steel and completion of finished cars, so that steel shipments received during the current quarter will not show up on railroad tracks as freight cars until toward the end of the year.

Gas Order Limited

Restrictions to apply east of Mississippi principally

WASHINGTON.—Proposed restrictions on expansion of natural-gas service will be limited largely to states east of the Mississippi River.

A formal announcement that no restrictions are contemplated in Mississippi or Louisiana, or anywhere west of the Mississippi with the possible exception of some tight areas in Missouri, Iowa, Nebraska, Minnesota, and South Dakota was issued by PAD over Secretary Oscar L. Chapman's name.

Also, Chapman said, the order may not blanket the entire East since there are areas in many states in which the gas supply should be sufficient to permit exceptions to or modifications of any order imposing limitations on new business.

The formal announcement was made after receipt of many protests from equipment manufacturers and gas companies in areas where there are no immediate prospects of shortage, some of which were filed also with the Federal Power Commission.

Council to meet.—The Gas Industry Advisory Council will meet here next week to discuss the proposed order, which would prohibit companies serving natural gas or mixtures of natural and manufactured gas from taking on new customers except, in the case of large-volume customers on completely interruptible service, with the consent of PAD.

Chapman explained that prior to the start of the defense program last fall the gas industry had laid out an ambitious program of expansion which has bogged down because of the inability to secure line pipe. Even if all the steel alloted to PAD for gas lines becomes available, which is highly doubtful, he said, it will be only approximately 59 per cent of the quantity needed by the high-priority projects alone.

Control desirable.—"Under these circumstances it appears desirable to place under control the sale of gas in large volumes and for house heating in areas which will not have sufficient supplies to support present consumers, including important defense plants," the secretary stated.

"In consultation with industry, PAD is currently assessing the whole situation with a view to drafting a restriction that will apply only to those areas in which it appears that gas shortages in varying degrees of severity may occur."

Chapman gave assurance, too, that any order issued will be so drafted as to permit special consideration for areas recently connected or in the process of being connected to natural-gas lines and that every effort will be made "to avoid stifling reasonable development of those new areas within the limits that may necessarily be imposed by the availability of construction materials and gas."

Uinta Basin Discovery

Bottom-hole-pressure tests were being conducted this week as crews erected additional tankage at the new discovery well of Carter Oil Co. in Duchesne County in the Uinta basin of Utah. Carter's 1 Duchesne Ute-Tribal, C SE NE 17-4s-4w flowed into tanks 363 bbl. of 42.9°-gravity oil with 20 per cent of filtrate in 36 hours. 12 minutes. Production is from fractured shale zone of basal Green River (Tertiary) age, penetrated to 7,596 ft., present total depth.

"Good Faith" Bill Opposed

WASHINGTON.—Rejection of legislation which would legalize the right of sellers to cut prices in good faith to meet the prices of a competitor was urged upon a House judiciary subcommittee last week by the Federal Trade Commission.

Measures which would give immunity from the antidiscrimination provisions of the Robinson-Patman Act to sellers meeting competitors' prices are pending in both House and Senate. The Senate is scheduled to vote on one, the McCarran bill, August 2 or 3.

The bills would merely write into law the decision of the Supreme Court in the Standard Oil Co. (Ind.) case that good faith in cutting prices to meet competition is an adequate defense against charges of discrimination under the Robinson-Patman Act.

MID-CONTINENT

Barton County Wells Sold

WICHITA.—Purchase of eight wells in the Cheyenne View area of Barton County by Kewanee Oil Co., of Tulsa and Philadelphia, from George H. Hannum, of Wichita, was announced last week. Consideration was not revealed.

The transaction covers two leases currently producing 335 bbl. of oil per day from the Lansing-Kansas City lime reservoir, found at an average depth of 3,100 ft. Lanterman "B" lease, SW 14-19s-12w, has five wells on production. The other lease on the Pflugi fee, SE 15-19n-12w, has three producing wells.

Flood Permit Asked

FREDERICK, Okla.—S. D. Johnson, as head of the newly formed Frederick Pool Co-Operative Association, has filed application with the Corporation Commission of Oklahoma for permission to water-flood Frederick pool in Tillman County.

Federick field has 52 producing oil wells from three producing zones in upper and lower Cisco (Pennsylvanian) sand at depths between 2,700 and 2,800 ft.

Mission to Teheran

Harriman's arrival greeted by Red-inspired riots; Iran offers crude oil on "open" basis, discloses New York offer

W AVERELL HARRIMAN, special assistant to President Truman, arrived in Teheran last week end on a mission described as the final hope of effecting some settlement of the Iranian oil nationalization.

If Harriman should fail to persuade the Iranians at least to accede to the International Court recommendation for interim British operation, it seems almost certain that the company will evacuate its remaining personnel from the area and much, if not all, of the industry will be closed down.

Riots broke out in Teheran coincident with Harriman's arrival in the Iranian capital. Reports described increasing feeling between supporters of Premier Mossadegh's National Front and the Communist Tudeh party. Several persons were killed when police and army units dispersed demonstrators.

On reaching Teheran, Harriman told diplomats and reporters who met him that he was convinced that "with friendly discussions, a solution can be found." The presidential envoy brought another message from President Truman to the Iranian premier. He also said he was prepared to confer not only on the oil crisis but also on general economic assistance for Iran.

Little hope held. — There was little to indicate that the Iranian officials are prepared for anything except an effort to convince Harriman of the justice of their case. President Truman's offer to send Harriman may have been accepted by Iranian Premier Mossadegh principally to avoid offending American and world opinion.

Of even greater importance to Iran in its present predicament is the hope of obtaining some measure of American support. Responsible Iranians now seem to realize that the United States is the only country that could provide the necessary technical assistance and marketing facilities. Without these, the Iranian oil industry at best could produce only a trickle of its former 700,000-bbl. daily.

Walter J. Levy, New York economic consultant now an adviser to the Venezuelan Government, and the President's Materials Policy Commission, accompanied Harriman, as did William M. Roundtree, director of the Greek-Turkish-Iranian section of the State Department's Office of Near Eastern Affairs.

New sales policy. — Earlier, Iranian authorities indicated that they are now prepared to sell oil on an open basis without regard to provisions of the nationalization law which specify priority to Anglo-Iranian's customers. Since none of Anglo-Iranian's buyers have come forward to do business with the national company, Iranians said they had no further obligation in this respect.

It was disclosed in Teheran that a "Columexport, New York," had offered to take some of the Iranian oil. In New York, an official of Columbus Export Co. said that the firm had not yet had a formal offer from the Iranian national organization but that, if it were received, the company would consult with the State Department and be guided by its policy on the transaction.

The shutdown of shipments from Abadan was felt in India. The director of civil aviation in that country ordered a reduction of 10 per cent in internal air flights because of a fuel shortage. Abadan produced some 18,000 bbl. daily of aviation gasoline which was widely marketed throughout the Eastern Hemisphere.

In Baghdad, Iraq, officials of Iraq Petroleum Co., said that I.P.C. would modify its refining facilities at Kirkuk in order to supply the Iraq market and make up for the loss of Iranian products normally moved across the border.

Purpose vague. — The exact purpose of Harriman's trip to Teheran was a point of some contention. While Washington reports said Harriman would assist in settling the dispute, the British emphasized that the presidential envoy would not act as a "mediator."

Premier Mossadegh told President Truman Iran was ready to enter into immediate discussion, but attached the significant proviso that Iran's "indisputable" national rights be respected in accordance with the laws

NATIONALIZATION TURMOIL.—These two scenes illustrate current conditions in Iran which up to a month ago was the world's fourth largest oil producing country. They show the feverish excitement aroused by the nationalization action against Anglo-Iranian Oil Co., Ltd. Left shows the company's information offices in Teheran after they had been invaded by demonstrators who pulled down the company's sign and hung Persian flags from the balcony. In the other photo, Iranians are trampling the signboard torn from the company's offices.

on nationalization of the industry. The British ambassador to Teheran commented that the British could not resume negotiations on this basis.

The report Harriman makes on the results of his discussions in Teheran will undoubtedly have considerable weight in determining future United States Government—and hence American oil-company—policy. The United States has shown its support for the British position but always in the background of the diplomatic moves is the ever-present fear that Iran might be lost to the non-Communist western world.

Economic crisis. — An approaching economic crisis for Iran was indicated last week in a report given parliament on the work of the "take-over" mission which has been in Abadan for a month or more and whose activities caused the suspension of exports. The parliament was told that Iran would have to prepare for serious economic difficulties if production continues at a standstill.

Subsequently, Premier Mossadegh's government introduced three emergency financial measures. One would allow the government to issue bonds designed to raise the equivalent of about $40,000,000. The other measures would permit the government to draw on Iran's sterling balance on London for about $39,200,000 and authorize acceptance of a $25,000,000 Export-Import bank loan for internal improvements in the country. The loan was arranged before the nationalization law was passed.

Heavy losses.—Not only Iran but also Britain stands to suffer heavy financial loss, at least temporarily, from the nationalization of the oil industry. Oil is the most significant single item in Britain's balance of trade, and in London last week, the British chancellor of the exchequer said the initial cost of replacing Iran's output would be between $300,000,000 and $400,000,000 a year.

The loss of Iranian oil deals a heavy blow to Britain's efforts to avoid dollar shortages in its foreign trade. A substantial part of the crude and products obtained elsewhere will have to be paid for in dollars. However, these expenditures will decline as British-owned and other sterling refining and production is built up elsewhere.

The apparently somewhat dim British Government hopes for a settlement which will permit the company to continue to operate the industry within the framework of nationalization resulted in a change in policy early last week under which plans for an immediate full evacuation of Abadan and the fields were postponed. Last week, about 1,500 of the normal British staff force of some 2,600 remained in Iran, and it was made clear that most of these will stay on unless there is some further action on the part of Iranian officials to force them out.

Caretakers remain.—Most of the British group still in Iran were in a caretaker status. The refinery throughput was down to about 85,000 bbl. daily, one-sixth of normal capacity. Some oil was still being run to storage, but it was believed that with a further reduction the plant could be kept operating indefinitely with the production going to internal sales in Iran and requirements of the powerhouses in Abadan.

Anglo-Iranian turned over one of the five fields supplying Abadan to the Iranians. Gach Saran, with a production of about 40,000 bbl. daily, was closed in as the last five British employes and 10 Indians and Pakistanis were withdrawn.

British buy here.—As a temporoary measure, the affected British companies—Shell and Anglo-Iranian—were continuing to buy products in this country. On account of the tight supply of heavy fuel oil in the East and on the Gulf Coast, some cargoes of this product were taken in California for Europe.

Iran Roundtable

Thornburg blames British for nationalization trouble

NEW YORK.—Even if the Iranian Government slashes prices for oil in the Persian Gulf, it cannot hope to sell more than "a few bucketsful" without the transportation and marketing facilities of the large international oil companies.

This comment, among others, was offered here last week by Max Thornburg, former State Department oil adviser, at a roundtable discussion of the nationalization issue conducted by the Asia Institute.

Aside from Thornburg's remarks, the forum discussion was devoted largely to presentation of the Iranian point of view by a group of Iranians representing the United Nations delegation, the embassy in Washington, and Iranian private interests in this country.

Thornburg made clear his opinion that no recognized oil company would take any interest in Iran and would provide no assistance unless ordered to by the U. S. Government. He said there was no inclination on the part of American oil companies to make it appear simple and easy to nationalize oil anywhere. American companies, he said, have no love for Anglo-Iranian, whose actions touched off a situation that could easily endanger their own holdings in other countries.

Thornburg, who lives on an island in the Persian Gulf given to him by the shiekh of Bahrein, for 27 years was with the Standard Oil Co. of California and Caltex organizations and for the last 5 years was adviser to the Iranian Government in connection with its 7-year economic-development plan. He left Iran last January, he said, after he was told by the State Department he was not acceptable to the British.

"Americans are too prone to consider what has happened in Iran as an oil problem alone," Thornburg told the forum. "All the problems of oil could be solved in one afternoon if there were a strong, responsible central government in Teheran. Unless we have a strong government, independent of foreign influence, dedicated to the welfare of the people and one that wants to use its royalties for the people, then it's economic disintegration and another Korea in Iran."

Thornburg said British policy—aside from oil—has been to prevent a strong central government in Teheran. As a result, he said, forces which have been building up in the country for years have suddenly focussed on the oil issue. Oil nationalization, he added, was unfortunate and unnecessary. The basic trouble is the social wrong that has long existed in Persia.

One of the Iranian speakers, Seifpour Fatemi, professor of Persian at Princeton University and an adviser to the Iranian Government, told Thornburg that the Mossadegh government is the responsible central government he said is needed. It is the first with the genuine support of the people, and Iranians now are sending in money, even their wedding rings, to assist the government in its crisis, he continued.

Fatemi and other Iranian speakers accused Britain of a long record of misdeeds in Iran going back a hundred years or more.

New Depth Record Set

A new drilling depth record for the Middle East is reported to have been established by the deep test of Kuwait Oil Co., Ltd., in Burghan field in Kuwait.

The well is understood to have reached total depth at 13,729 ft. with drilling shut down for complete testing. The present well has been drilling more than a year with some extremely hard formations encountered at the greater depths.

The objective of the deep test was to investigate the formations underlying the present Burghan sands from 3,500 to 4,800 ft. The highly productive Burghan sands of Middle Cretaceous differ from the limestone production obtained elsewhere in the Middle East.

The first deep test in Burghan field was undertaken nearly 2 years ago. After a fishing job at about 5,000 ft., the rig was moved and another hole commenced.

The previous depth record in the Middle East was held by Ratawi 1 which was drilled by the Iraq Petroleum Co., Ltd., organization west of Basrah. As far as is known, no other wells in the Persian Gulf area have gone below 13,000 ft.

More than America spent to win its Independence

THE Revolutionary War lasted 8 years and its direct cost was $74,555,642.

This sum is considerably less than the amount Youngstown is spending on expansion--its share of the steel industry's program to help preserve America's 175-year-old freedom from Communistic attack.

Work on a $90,000,000 construction project at the Indiana Harbor Works, East Chicago, Indiana, is under way. It includes a 1500-ton blast furnace, 75 new coke ovens and 8 - 250 ton open hearth furnaces, heating furnaces, a high-lift blooming mill, with 6 - 3 hole recuperative soaking pits, ore dock extension, unloaders and ore bridge, and a vast array of other facilities needed to produce the additional 1,000,000 ingot tons of steel involved. By the end of 1952, the steel industry expansion program will raise the total steel producing capacity of the United States to over 117-million ingot tons. This is more steel than is made in all the rest of the world combined.

This tremendous investment by the shareholders of private industry is possible only with adequate profit--profit earned in the past and to be earned in the future. This is a symbol of public confidence--confidence that the American system of free enterprise is right *and worth saving.* Confidence that it will continue to be our way of life through the years ahead.

Scrap Metal is Critical Again

The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio

Export Offices--500 Fifth Avenue, New York

MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.

Iraq Agreement

Government expected to get 50-50 income split

FINAL agreement between the Iraq Government and Iraq Petroleum Co., Ltd., on a new division of oil revenue and other matters appears to be near.

Conforming to the current trend in the Middle East, it will give the Iraqis a 50 per cent participation in the company. Details of how this will be accomplished are not fully known and may not yet be completely agreed upon.

I.P.C. operates Kirkuk field and is building a new 30-32-in. pipe line to the eastern Mediterranean. Through what it calls associated companies, it controls shut-in fields in the Mosul area and new production developed since the war in Basrah.

Reports published last week in Baghdad again mentioned the 50-50 deal tentatively decided and said that payment would be in oil. Royalty would remain the same, and the oil payment presumably would provide the difference up to about half the company's net profits.

Iraq would sell the oil at prevailing prices. The Iraq Government has long had plans for the construction of a government refinery which apparently would use some of the crude later.

Royalty departure.—Such an oil payment would be a departure from the generally prevailing Middle East royalty, which is on a flat-tonnage basis. The oil payment thus would tie some of the government's revenue to world oil prices.

Reports also mention that the separate and different terms now in effect for the Basrah, Kirkuk, and Mosul concessions would be unified. Another disputed point — whether royalties would be paid on the free market or official price for gold—reportedly will be left to a decision in British courts as planned earlier.

Income-tax question.—The reports in the Iraqi capital said a point still not settled was the question of subjecting I.P.C. to Iraqi income taxes. The Iraqis want to levy these taxes and have the company, now headquartered in London, to move its offices to Baghdad. The present Iraq concessions as well as those elsewhere in the Middle East now provide a tonnage payment in lieu of taxes in the country.

I.P.C., owned by American, British, French, and Dutch interests, has been pressing the Iraq Government to present the new agreement to parliament in the near future. On the other hand, it is said the Iraqis desire to delay this to see what the outcome is in Iran.

Other discussions.—The present ferment in the Middle East over greater government oil revenue was reflected in an unverified report originating in Beruit that Syria and Lebanon have opened joint discussions on the question of demanding an increase in the fees paid to them by Trans-Arabian Pipe Line Co. for Tapline right-of-way.

These are nonproducing countries which are now paid for transit rights. The agreement between Tapline and Syria was reached only after prolonged negotiation 2 years ago.

Rotary-Rig Upswing

501 running in all foreign regions excluding Canada, Communist areas, West Germany; Mexico makes big gain

THE large-scale expansion of drilling activity in Mexico during the last year has brought a marked increase in the total of rotary rigs operating outside the United States and Canada.

Available information shows a total of 501 rigs running in all foreign areas exclusive of Canada, the Communist areas, and western Germany. This figure compares with 453 in November of last year.

The 501 total exceeds the previous high of more than 480 rigs in the latter part of 1948. The 1948 peak represented the culmination of a steady climb in the total following the end of the war. The slump in the oil business and particularly in Venezuela early in 1949 brought a sharp reduction in the number of rigs in operation, but since then there has been a gradual upward trend.

Mexican gain.—Of the increase of 48 rigs since last November, Mexico accounts for approximately four-fifths. There are now reported to be 80 rigs running in Mexico as compared to slightly more than 40 last year. Mexico now has almost as many rigs in operation as Venezuela.

The stepped-up activity in Mexico is due both to expanded programs of Petroleos Mexicanos and the several American operators exploring in the country. The Pauley, CIMA, Sharpless, and Isthmus Oil interests all are drilling in Mexico. Pemex only recently undertook its Lower California test using a California drilling contractor.

Only other drilling in North America outside Canada is in Alaska and Cuba. Gulf has one rig running on an offshore test in Cuba, but there have been renewed efforts in recent months to revive interest in the island which has been the scene of intermittent exploration for the last half century. The Navy-sponsored program in Alaska uses two rotary rigs. In addition there are several cable-tool outfits in this Arctic operation.

Venezuelan upturn.—A moderate upturn in Venezuelan drilling has been noted since the first of the year. Operating companies there are now using about 95 rigs in comparison to 90 last November. The high point in Venezuelan drilling came in 1948 when there were about 133 rigs running in the country.

All indications point to further expansion of drilling in Venezuela. The country's present production of more than 1,700,000 bbl. daily is at or close to maximum possible under sound engineering. The loss of Iran's heavy fuel-oil production in all probability will increase demand for Venezuela's heavy crude, and a major increase in production will be possible only with stepped-up drilling.

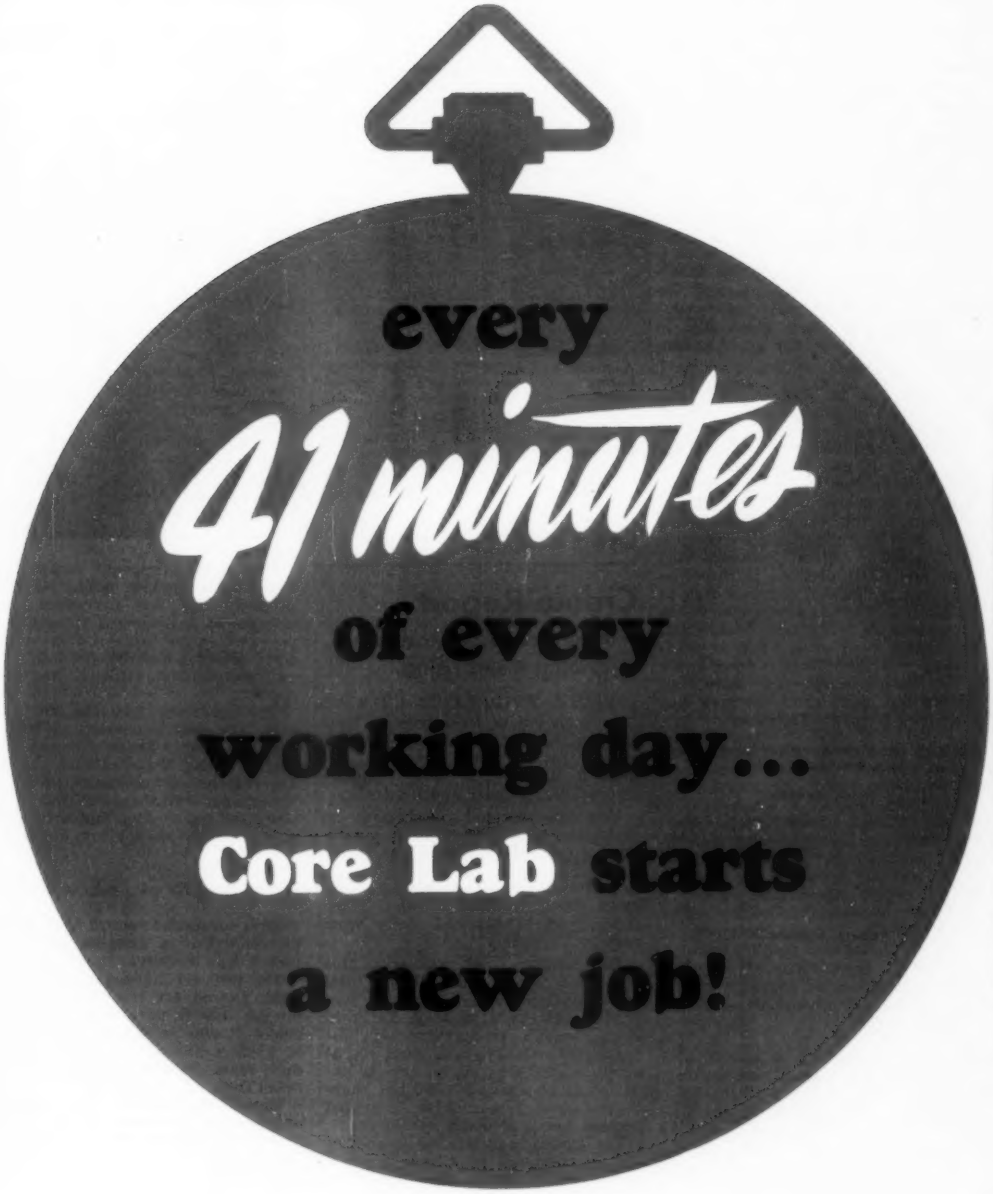
There have been new reports that the Venezuelan Government is considering granting oil concessions, and if this occurs, more rigs would be eventually in operation by the new companies. Venezuela has granted no new concessions since 1945, and the prospects this policy will be ended is being closely watched by several potential Venezuelan operators, including Cities Service, Superior, and Conorado, among others.

Colombian revival.—The revival of activity in Colombia the last year has raised the number of operating rigs in this country to 15, 2 more than last November but still below the 1948 figure. Drilling also has picked up in Peru the last 7 months, most of it due to International Petroleum Co., Ltd. There is little exact information on Argentine activities but the total of 45 rigs is considered accurate by responsible sources.

Europe.—France continues to be the most active operator in western Europe outside western Germany, for which current information is not available. Rigs running in Denmark, Spain, and Portugal reflect minor exploration programs. There also have been unconfirmed reports of drilling in southern Sweden.

Middle East change. — The principal change in the figures for the Middle East is in Iran. At present all exploratory work is closed down with approximately half of the field personnel evacuated. Earlier, before Anglo-Iranian Oil Co.'s operations were halted in the government nationalization, 11 rigs were reported running in the company's fields. All work had been halted by early July after oil exports stopped.

Despite this decline, the total of rigs



"Providing more reservoir revenue . . . through the production of more recoverable oil."

in the Middle East showed an increase from 35 to 36. Saudi Arabian drilling has been expanded in response to greatly increased production and prospects of continued heavy demand. Three rigs are reported operating in Kuwait, but an increase is likely if this shiekdom is called on to make up a substantial part of the Iranian loss over an indefinite period. There are now reported to be several shut-in wells in Kuwait capable of production as necessary.

Other changes in the Middle East—not counting Iraq, Bahrein, and Qatar—indicate small-scale exploration programs which are constantly in progress throughout the world as conditions permit.

Far East.—In the Far East, the one rig running in Australia is a government-sponsored operation. Shell recently discontinued exploration activity which it had been carrying on since before the war in Queensland. The rigs in operation in New Guinea are both in the western part of the island and in Australian New Guinea. In Indonesia, Caltex, Standard-Vacuum, and Shell all share in the drilling activity. Caltex has two rigs in its Central Sumatra concession which it expects to bring into commercial production next year. Shell is wildcatting in British North Borneo where it has developed output to more than 100,000 bbl. daily since the area was recovered from the Japanese.

ROTARY RIGS IN OPERATION OUTSIDE THE UNITED STATES

Country—	June 1951	Nov. 1950	Mar. 1948
North America			
Alaska	2	4	2
Cuba	1	0	1
Mexico	80	41	37
Total	83	45	40
South America			
Argentina	45	45	50
Bolivia	2	2	2
Brazil	5	5	5
Chile	5	4	4
Colombia	15	13	24
Ecuador	11	13	11
Paraguay	0	0	2
Peru	23	18	21
Trinidad	26	26	22
Venezuela	95	90	133
Eastern	(50)	(46)	(67)
Western	(45)	(44)	(66)
Total	227	216	274
Europe			
Denmark	3	2	1
England	8	9	9
France	30	30	22
Italy	20	23	15
Netherlands	8	7	4
Portugal	2	2	0
Spain	2	2	3
Total	73	75	54
Africa			
Algeria	5	5	2
Egypt	3	3	8
Ethiopia	0	1	0
French Equatorial Africa	2	3	1
French Morocco	6	6	6
Nigeria	1	1	0
Tunisia	3	2	2
Total	20	21	19
Middle East			
Bahrein	2	2	2
Iran	5	8	9
Iraq	9	9	6
Kuwait	3	2	9
Lebanon	0	0	1
Neutral Zone	0	1	0
Oman-Dhofar	1	0	0
Qatar	3	2	2
Saudi Arabia	8	5	7
Syria	0	1	3
Trucial Coast	1	1	0
Turkey	4	4	2
Total	36	35	41
Other Asia			
Australia	1	2	2
Burma	0	0	2
Indonesia	28	26	21
India-Pakistan	10	10	12
Japan	15	15	9
New Guinea	7	6	5
Philippines	1	2	2
Total	62	61	53
Grand total	501	453	481

LATIN AMERICA

Creole Report

May production off but drilling trend rising

CREOLE PETROLEUM CORP.'S production in May dropped back slightly from the record high levels of the two preceding months, but drilling activity of the company showed a continued upward trend.

Creole's operated production in May averaged 700,421 bbl. daily against 705,998 bbl. daily in April. Of the May output, 552,579 bbl. daily came from Lake Maracaibo, 4,021 bbl. daily from Cumarebo and Mara fields, and 143,821 bbl. daily from eastern Venezuela.

The company's net production plus purchased royalty oil, reflecting total crude available to the company, was 748,848 bbl. daily in May. Early in July, Creole's production, net plus purchased royalty, was running at about 780,000 bbl. daily, and is expected to go above 800,000 bbl. daily in the next few months, provided present heavy demand continues.

The gradually increasing number of rigs in operation by Creole reached an average of 12.6 in May, compared to 10.1 in April. Another rig was placed in operation in July, and a continued slow rise is expected, although the company's policy is to avoid any sudden, sharp change in drilling with resulting labor problems.

Completions.—According to the company's May report, 13 wells were completed during the month, 11 of them field wells all in the Lake Maracaibo area, and having an average initial output of 753 bbl. daily. The two exploratory operations were in Maracaibo, one well with an average initial production of 1,414 bbl. daily and a total depth of 5,480 ft., and in Pedernales, one well with an average initial production of 1,605 bbl. daily and a total depth of 7,862 ft.

During May, runs at Caripito were down sharply to 26,689 bbl. daily on account of maintenance operations performed during the month. Capacity of the refinery is 60,000 bbl. daily. Runs at Amuay during May averaged 77,476 bbl. daily.

De Mares Accord Reached

International Petroleum Co., Ltd., and the Colombian Government have reached final agreement on future operation of the De Mares concession after it reverts August 25.

An official announcement in Bogota said the agreements provide for technical assistance in the production phase and for operation of the Barrancabermeja refinery by the company *(The Oil and Gas Journal, May 31, 1951, page 69, and January 4, 1951, page 35)*.

The final agreement comes little more than a month before all fixed property in the concession area changes to government ownership as provided in the original 30-year contract under which Tropical Oil Co., an International affiliate, has operated.

The agreement provides for modernization and expansion of the refinery through a $10,000,000 loan from International. Two officials of the government oil company, Empresa Nacional de Petroleos, left Bogota last week for the United States to study bids for this project.

Manabi Scores in Ecuador

First successful well of Manabi Exploration Co. in Ecuador was completed last week.

The well, 45 Tigre, in the El Tigre field, flowed 440 bbl. of 40°-gravity oil per day through a ¼-in. tubing choke. It was drilled to a total depth of 3,392 ft. and plugged back to produce from Atlanta sandstone topped at 2,135 ft.

Manabi Exploration is an affiliate of the newly formed Canada Southern Oils, Ltd. The new producer is situated on properties purchased several months ago from Ecuador Oilfields, Ltd., a subsidiary of British Controlled Oilfields, Ltd.

El Roble Well Gages 600 Bbl.

BARCELONA, Venezuela.—Completion gage was reported last week for the new El Roble concession discovery of Pantepec Oil, C. A., in Anzoategui, Venezuela.

Its RPN-27 produced 600 bbl. of 55°-gravity oil per day through a ½-in. choke from a depth of approxi-

(Continued on page 153)

To New Position

McWilliams leaving Carter to join Jersey Standard

J. R. McWILLIAMS, executive vice president and director of Carter Oil Co., affiliate of Standard Oil Co. (N.J.), will assume the post of deputy coordinator of Jersey's worldwide producing activities on August 1.

McWilliams, who will be located in the New York office, has resigned his position with Carter Oil on that date.

He has had broad experience in producing operations since graduating from University of Michigan in 1919. After brief service in the armed forces he spent the next 15 years in engineering and conservation work with oil companies and state agencies and joined the Carter organization in 1934.

Two years later McWilliams was elected a vice president and director of the Standard Oil Co. (La.) where for 5 years he was in charge of producing operations. He was made a director and manager of Carter's production department in 1941 with headquarters at Tulsa. His election as vice president followed in 1944 when he went to Billings, Mont., as manager of the firm's expanding operations in the Northwest division.

After a year's leave of absence during which time he served as director of the production division of the Petroleum Administration for War, he returned to Carter's headquarters in Tulsa and subsequently was made executive vice president.

M. A. Wright, formerly deputy coordinator of all producing activities of Standard Oil Co. (N. J.), has been elected executive vice president of International Petroleum Co., Ltd., effective August 1. Wright graduated from Oklahoma A. & M. College in 1933 and joined Carter Oil Co., a Jersey Standard affiliate, as junior engineer. After serving in various engineering positions in Oklahoma and Louisiana for Carter, he became chief petroleum engineer in 1943 and assistant manager of the production department the following year. In 1946 he became an executive assistant in the producing-coordination department of Jersey Standard, and in 1949 was named deputy coordinator of producing activities.

Thomas Brownfield has been named vice president in charge of operations for Carter Oil Co. He joined Carter in 1927 as a clerk in the oil runs department, promoted to chief scout in 1935. In 1941 he was named an executive assistant in the producing department of Standard Oil Co. (N. J.) in New York. He returned to Carter in Tulsa in 1946, serving as secretary of the company. Shortly after becoming manager of Carter's economics department and coordinator of manufacturing and marketing, he was elected to the board of directors in 1948. **G. Dawson Priestman,** assistant manager of the economics department, will succeed Brownfield as department head. Brownfield will be in charge of all the firm's producing, manufacturing, and marketing operations.

Brandon H. Grove, formerly of the producing department, Socony-Vacuum Oil Co., Inc., has been named general manager of Socony-Vacuum operations in Egypt and the Red Sea to succeed **Robert S. Stewart,** retired. After receiving a doctor of philosophy degree in 1934 from University of Chicago, he joined Socony and spent the next 4 years in the firm's European offices. He returned to the United States in 1940, and after a training period went to Spain and Colombia. He was on loan to the Foreign Economic Administration from 1943 to 1946, and was in Europe for Socony from 1946 to 1949, when he returned to New York. He was transferred to the Cairo, Egypt, office in early 1950.

Dr. Charles F. Weinaug, chairman of the petroleum-engineering department at the University of Kansas, has been appointed to the engineering committee of the Interstate Oil Compact Commission, replacing **Dr. Eugene A. Stephenson,** who recently resigned.

H. H. Bradfield, district geologist at Wichita Falls, Tex., for The Texas Co., has been named senior geologist on the manager's staff of the production department, with headquarters in Tulsa. He will be succeeded at Wichita Falls by **Harvard Giddings,** geologist in that office. Bradfield joined the firm in 1935.

David S. Kilgour has resigned as secretary of the Western Oil and Gas Association, Los Angeles, after 26 years with the association. For 11 of those years he also was secretary of the Pacific Coast section of the American Petroleum Institute's Production Division and currently is a member of its advisory committee.

Jesse A. Rogers, district geologist for The Texas Co. at Midland, Tex., has been promoted to senior geologist in the division office at Fort Worth. **Robert H. Martin,** district geologist at Abilene, Tex., has been transferred to Midland to replace Rogers. **N. D. Raman,** geologist at Fort Worth, succeeds Martin at Abilene.

Dr. Harold Gershinowitz, director of Shell Oil Co.'s division of exploration and production research and head of the Houston area production laboratory, has been promoted to vice president in charge of the newly created technical service organization. The new unit will serve exploration and production activities of the firm throughout North America and will also provide advanced training for specialists in oil exploration and production. Assisting him in the new service will be **Dr. Noyes D. Smith,** Jr., research manager in charge of the laboratory, and **J. Chalmers,** technical services manager, with **F. Goldstone** as exploration assistant, and **Dr. F. Brons** as production assistant. **W. L. McKinnon** will be office manager.

Edwin L. Smith, vice president of Superior Oil Co. of California at Oklahoma City, has resigned and will become an independent operator. He has been with the firm 7 years. About 18 months ago he was elected a vice president of the California firm and a vice president and director of two subsidiaries operating in the Middle East.

W. F. Fitzgerald, division geologist at Midland, Tex., for Continental Oil Co., has been transferred to Amarillo, Tex., as division geologist. The firm has expanded its district exploration offices in Amarillo, making it a division headquarters.

Claude I. Bigelow, formerly in Esso Standard Oil Co.'s East Coast manufacturing division, has been promoted

PERSONALS

to head the process department at the Bayway, N. J., refinery. He is succeeded as coordinator of East Coast refining operations by **Paul F. Hawkins. John J. Waybright,** formerly engaged in cost analysis work in the New York office, has been named to the newly created post of assistant to the general superintendent at the Bayway refinery. **John J. Kennedy,** formerly technical assistant in the thermal cracking and light-ends section of the distillation and cracking division at the Bayway refinery, has been promoted to technical assistant in the oil movement and storage department. He is succeeded by **Lester S. Gibbs,** formerly with Creole Petroleum Corp., Caracas.

George F. Mitchell, president of Peoples Gas Light & Coke Co., Chicago, has been nominated for presidency of the American Gas Association. The list of nominees will be placed before the membership for election at the convention in St. Louis October 15-17. Others nominated include: **Charles E. Bennett,** president of manufacturers Light & Heat Co., Pittsburgh, first vice president; **Earl H. Eacker,** president of Boston Consolidated Gas Co., second vice president; and **Edward F. Barrett,** president of Long Island Lighting Co., Mineola, N. Y., renominated for treasurer.

John S. Baker, subsurface geologist for Shell Oil Co. at Midland, has resigned to become a consulting geologist in Midland. Baker graduated from Princeton University in 1945 with a degree in geology and worked for Shell in other regions for 3 years prior to going to Midland in 1948.

Robert A. Dean, independent operator associated with **Travis B. Dean,** has moved offices from Abilene, Tex., to Fort Worth.

Harley L. Daughters, Jr., has been transferred from the Kilgore, Tex., office of the Texas Railroad Commission to Corpus Christi, Tex., as senior engineer. Daughters is a graduate of Texas A. & M. College and has been with the commission since 1948.

T. B. Hickman has been appointed manager of the crude-oil purchasing department, southern division, of Gulf Oil Corp., and **J. W. Pyron** has been named special representative of the department. Hickman will headquarter at Houston and Pyron at Fort Worth.

William E. Allen has been promoted from assistant foreman at Magnolia Petroleum Co.'s Brownfield producing district to production foreman in the Kermit, Tex., district.

L. A. Castler, job engineer for General Petroleum Corp. at Vernon, Calif., has been promoted to project engineer.

Pete Gardett, assistant supervisor of exploration for General Petroleum Corp., has resigned after 12 years with the firm to enter private consulting work with headquarters at Los Angeles.

Joseph T. Dawson, assistant to the vice president of Renwar Oil Corp., has resigned to open consulting offices in Corpus Christi, Tex. A graduate of Baylor University, Dawson started as a roughneck in East Texas field in 1930 and later worked for Humble Oil & Refining Co. He joined Renwar as a geologist in 1939 and became assistant to the vice president in 1947.

Bert L. Ryan, area manager in Midland, Tex., for Shell Oil Co., has been transferred to Houston, where he will assume new executive duties in the area offices. Other changes in the firm include: **L. O. Storm,** division exploitation engineer, transferred from Hobbs, N. M., to Midland; **N. L. Dodge,** mechanical engineer, transferred from Houston to Franklin, La.; **R. L. Hall,** rotary driller, transferred from West Lake Verret, La., to Franklin as engineers' assistant; and **L. Sistrunk,** exploitation engineer, transferred from Franklin to the Delta district.

Lee A. Adams and **H. B. Walters** have opened Lee A. Adams Oil Properties offices at Denver. The firm will operate throughout the Rocky Mountain region. Adams and Walters formerly maintained offices at Oklahoma City and have been working throughout the Rocky Mountain area for the past year.

Margaret Pendleton, formerly instructor at Wellesley College in geology and cartography, has joined Continental Oil Co. in the Casper, Wyo., division office as geologist. She has a B.S. degree from University of Michigan and M.S. degree from University of Illinois.

R. G. Bryan, petroleum engineer at New Orleans for Union Producing Co., has been promoted to district petroleum engineer. **W. F. Ellis,** assistant petroleum engineer in the Jackson, Miss., district has been promoted to petroleum engineer. Other changes in the firm include: **J. D. Stahl,** junior assistant petroleum engineer in the Shreveport district, transferred to Houston as assistant petroleum engineer; **W. M. Payne,** operator "C" at Carthage gasoline plant, in the Dallas district, promoted to compressor station engineer; **Ellis Thomas,** crew foreman in the Southwest Louisiana district, transferred to the New Orleans district as section foreman; **J. A. Branton,** junior assistant petroleum engineer in the Jackson district, promoted to assistant petroleum engineer; and **T. J. Warren,** crew foreman at Jacksonville, Tex., transferred to Longview as district superintendent.

J. E. HESTON

J. Edgar Heston has been appointed manager of oil production for Petroleum Advisers, Inc., an affiliate of Cities Service Co., succeeding **Warren A. Sinsheimer,** recently appointed petroleum economics coordinator for the firm. Heston joined Cities Service in 1931 after graduating from University of Oklahoma. From 1941 to 1945 he served as assistant director of production of the Petroleum Administration for War. Upon the completion of this service, he became assistant manager of the oil production department of Petroleum Advisers.

Albert B. Dooley, formerly chief petroleum engineer for Belridge Oil Co. at McKittrick, Calif., has opened offices in Bakersfield, Calif., as a consulting engineer.

R. M. Twitchell, senior engineer for Phillips Petroleum Co. at Bartlesville, Okla., has been transferred to Okmulgee, Okla.

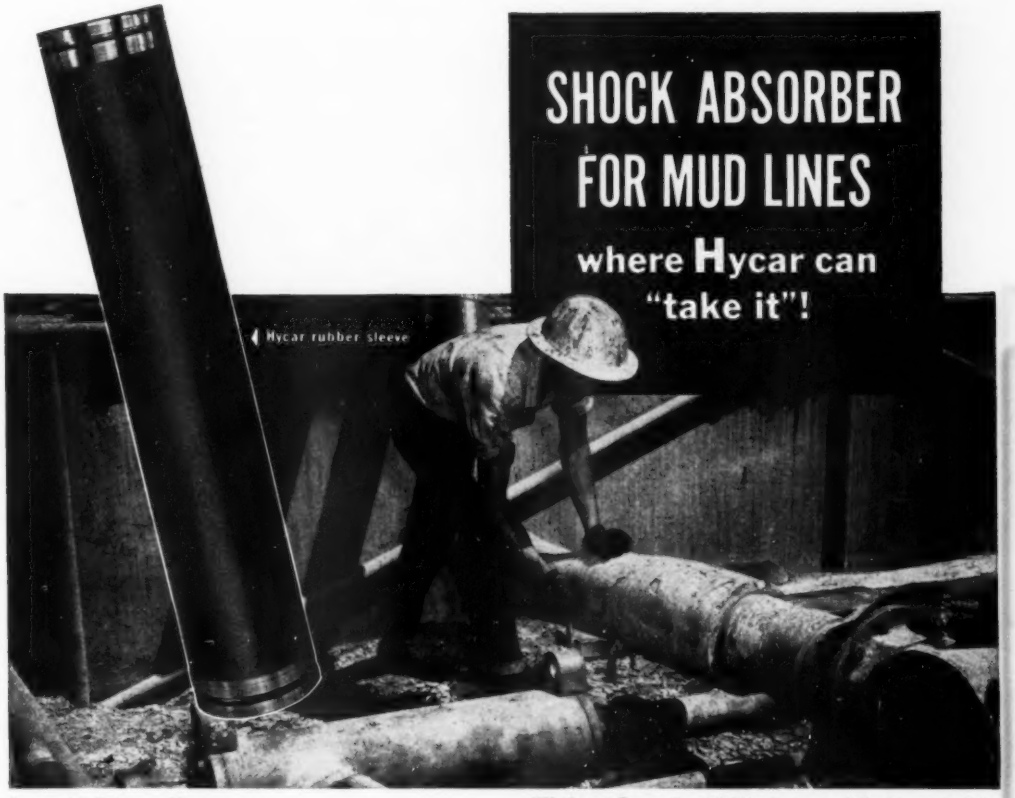
John B. Sansone, senior exploitation engineer in the Sacramento, Calif., district office of Shell Oil Co., has been transferred to the division office at Bakersfield, Calif.

Courtney E. Cook, engineer for Republic Natural Gas Co. at Corpus Christi, Tex., has been transferred to Dallas.

George M. Daudet has been appointed chief engineer of New York State Natural Gas Corp.'s Tonkin station, located near Murrysville, Pa. He began his 11-year term of service with Peoples Natural Gas Co., sister company of New York State. Prior to this promotion he was assistant chief engineer at Preston station near Waynesburg, Pa. He will succeed **Melbourne L. Blue,** who has been named chief engineer at the firm's new South Bend, Pa., station. **Roy C. Patterson** has been appointed district superintendent of the firm. Patterson's district, with headquarters at Tonkin station in Murrysville, will be known as the southern district.

Another new development using

B. F. Goodrich Chemical Company *raw materials*



Desurger installed on a mud line on a rotary drilling rig on the Gulf Coast.

"Fluidynamic Desurger" made by Valve Engineering & Development Co., Tulsa, Oklahoma. Hycar rubber sleeve made by F. H. Maloney Co., Houston, Texas.

MANY devices have been tried to "soak up" shocks caused by reciprocating pumps or sudden valve-closure in a fluid-carrying line. The most successful of these to come along is the Hycar-equipped "Desurger", pictured here.

The Desurger consists of two specially designed pipes, one inside the other. The inside pipe has a series of throttling orifices. The chamber between the two pipes is divided by a Hycar rubber sleeve.

By means of pressure throttling through the pipe orifices, and the action of the Hycar sleeve, damaging shocks are greatly reduced. Mud pump valve, liner and bearing life is increased, fuel consumption drops, protection to workmen against rotary hose failure is improved.

Naturally, the Hycar sleeve must withstand terrific punishment from the hammering drilling fluid. But Hycar can "take it". For Hycar has exceptional resistance to the effects of abrasive mud, gas, oil, heat and cold—and more damaging factors.

Hycar rubber compounds are used in many ways, in many fields. They may help you improve or develop products to do new time-and-money-saving jobs. Demand for Hycar exceeds supply, but limited quantities are available for development work. For helpful technical advice, please write Dept. HF-8, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco.

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GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON organic colors

PERSONALS

Ralph L. Miller has been designated chief of the fuels branch of the Geological Survey, United States Department of the Interior. He received his Ph.D degree from Columbia University in 1937 and then served as a lecturer and instructor until 1946. During part of the time he served in the Fuels Branch of the Geological Survey and in 1948 was designated chief of the Navy oil unit of the Alaskan and foreign branch, which position he has held up to the present.

J. L. Gamble, production engineer for Atlantic Refining Co., has been transferred from Dallas to De Ridder, La.

O. E. Van Meter, Jr., has been named assistant division petroleum engineer of Magnolia Petroleum Co.'s Gulf Coast division, with headquarters at Houston. Van Meter has been on leave of absence for the past 9 months taking graduate work at Texas A. & M. College. Prior to that he was petroleum engineer in Magnolia's West Texas division.

Melvin H. Gertz, process consultant and project engineer for **Robert L. Purvin,** at Dallas, has become a partner in the organization, and the firm will henceforth be known as Purvin & Gertz, consulting engineers. Gertz has been with the firm for the past 4 years. Prior to that time he was employed on the engineering staff of Humble Oil & Refining Co.

Henry Waszkowski, division petroleum engineer for Magnolia Petroleum Co. at Oklahoma City, has been transferred to Healdton, Okla., as assistant superintendent.

Norman E. Maxwell, Jr., petroleum engineer for The California Co., has been transferred from Waterproff, La., to Brookhaven, Miss.

B. I. Graves, vice president of Tide Water Associated Oil Co., New York; **F. O. Prior,** executive vice president of Standard Oil Co. (Ind.), Chicago; **Alvin H. Stack,** president of Tampa Gas Co., Tampa, Fla.; **John R. Suman,** vice president of Standard Oil Co. (N. J.), New York; **H. Gardiner Symonds,** president of Tennessee Gas Transmission Co., Houston; and **C. I. Weaver,** Springfield, Ohio, have been appointed as members of the natural-resources committee of the United States Chamber of Commerce.

Henry B. Wilson, Jr., formerly assistant manager of the employe-relations department of Standard Oil Co. (N. J.), has been elected to the board of directors of International Petroleum Co., Ltd., effective September 1. Wilson, a petroleum engineering graduate of the University of Oklahoma, joined the Jersey Standard organization as a student engineer with Humble Oil & Refining Co. He joined the employe-relations department of the parent company in 1941 after service in Argentina and Venezuela.

V. K. Benson, geophysicist for The Texas Co. at Lamesa, Tex., has been transferred to the Houston office.

Richard L. O'Shields, formerly an instructor of petroleum engineering at Louisiana State University, has joined Pure Oil Co. at Fort Worth, Tex., as a production engineer.

A. J. Ruthven Murray, formerly assistant managing director of Trinidad Leaseholds, Ltd., in London, has been made managing director of the firm. **E. G. C. Mardall** has been appointed assistant managing director. He will continue as general manager for the firm in Trinidad. **H. D. Acres,** formerly business manager, has become T.L.L.'s commercial director.

F. E. Doyle, who was recently named acting manager of the Clarkson refinery of British American Oil Co., Ltd., will assume part of the duties of **W. C. Gault.** Gault, who completes 41 years of service with British American next month, will continue as manager and handle special duties from time to time. Succeeding Doyle as acting assistant manager is **W. J. McGuire,** formerly superintendent of the topping and cracking unit at Clarkson.

Afton M. McConnell, toolpusher for Richardson & Stewart Drilling Co., has been transferred from Premont to Freer, Tex.

V. G. Bartram, president of Shawinigan Chemicals, Ltd., has been elected to head the newly organized petrochemical company, B. A.-Shawinigan, Ltd., owned jointly by British American Oil Co., Ltd., and Shawinigan. Vice president of the new company is **M. S. Beringer,** vice president for manufacturing of British American. Directors of the new firm include British American's **H. T. O'Neill,** vice president for finance, and **R. E. Irwin,** chief chemist.

Billy M. Easley has been named San Antonio district geologist for Sunray Oil Corp., replacing **F. M. McClain,** who is now associated with **George H. Coates.** Easley started with Barnsdall Oil Co. in 1948 and moved to San Antonio when Sunray and Barnsdall merged.

William Hommel, geologist for Gulf Oil Corp., has been transferred from Durango, Colo., to Casper, Wyo.

Martin R. Taylor, production engineer for Gulf Oil Corp., has been transferred from Seminole, Okla., to Tulsa.

Warren J. Souder, formerly geologist with The Texas Co. at Craig, Colo., has joined Bay Petroleum Corp. at Denver as geologist in the Rocky Mountain division.

DEATHS

Thomas Barger Gregory, 90, one of the early developers of the petroleum and gas industries in this country, died July 11 at Pittsburgh. He organized Union Heat & Light Co. to provide natural-gas service for several Pennsylvania towns. In 1909 he obtained an interest in Lone Star Gas Co., of which he became chairman. Later he and several associates initiated the steps that eventually led to the creation of Quaker State Oil Refining Corp., of which he continued to be a director. During World War I he served in Washington as assistant director of production of the oil division of the fuel administration.

Edward P. O'Neill, 59, a driller for Ervin Major in Arenac County, Michigan, died July 1 from injuries sustained when a rig collapsed while casing was being pulled.

Ben Fishman, 41, vice president of Aurora Gasoline Co., Detroit, died July 9 in Detroit. He started with Aurora in 1942 as safety director, moved on to become assistant cracking plant superintendent in 1944, a junior executive in 1945, and assistant vice president in 1949.

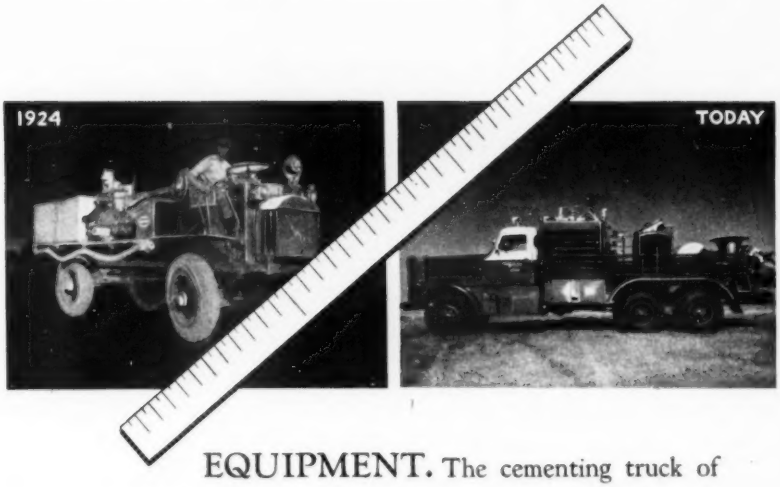
T. S. Eagon, 57, accountant for Parker Drilling Co., died July 12 in Tulsa. He had been with Parker for the past 8 years.

Herbert Milton Ash, Jr., 33, owner and operator of Crown Drilling Co. at Wichita, Kans., died July 4.

Thomas Henry Sledge, 78, superintendent for Standard Oil Co. on the Monte Christo, Calif., lease before his retirement, died July 8 at Oceanside, Calif.

Guy G. Vanderpool, 49, natural-gas supervisor in the West Texas-New Mexico division of Atlantic Refining Co., died July 6 at Plains, Tex.

BY ANY YARDSTICK... CEMENTING PRICES ARE LOW



EQUIPMENT. The cementing truck of 1924 was a sturdy but simple rig representing a cost of less than $6000.

The Howco cementing truck of today, designed to meet every condition that modern drilling may impose, represents a direct cost of more than $50,000 and an indirect development cost of many thousands more.

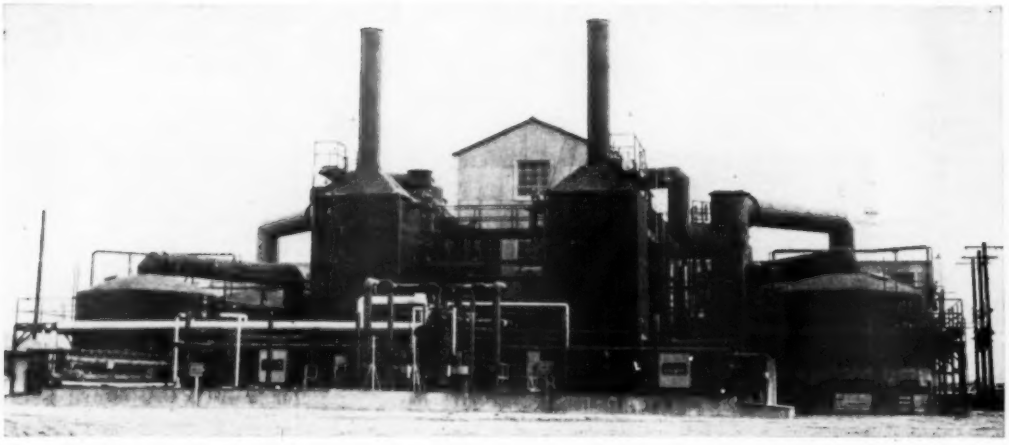
In other words, the cost of the basic equipment used in cementing has increased more than 700%. *Yet the cost of the average cementing job is actually LESS today than in 1924.*

By any yardstick, Halliburton cementing prices are low.

Erle P. Halliburton

Chairman of the Company

HALLIBURTON OIL WELL CEMENTING CO.
Duncan, Oklahoma



Texas Gulf Sulphur Co. plant at Worland, Wyo. Sulfur wash towers center foreground with converters at extreme right and left.

Texas Gulf Producing 300 Tons Daily Of Sulfur at New Worland Plant

This new $4,000,000 plant removes the H_2S and CO_2 from the natural gas and converts the H_2S to sulfur. This is then piped in the molten state to the stock piles. Only a fractional per cent of the sulfur is lost in processing.

NINE miles north of Worland, Wyo., Pure Oil Co. produces crude oil and natural gas from River Dome field. This natural gas contains approximately 30 per cent hydrogen sulfide and 2 per cent carbon dioxide, and, prior to processing, has no marketable value as natural gas.

A new $4,000,000 plant operated by Texas Gulf Sulphur Co. at River Dome field removes the hydrogen sulfide and carbon dioxide from the sour natural gas and converts the hydrogen sulfide to sulfur. This new plant is now producing about 300 tons of sulfur daily. It marks the first large-scale production of sulfur by Texas Gulf from sources other than the salt domes of Texas.

Main Units

The main units in Texas Gulf Sulphur Co.'s plant consist of an absorption unit for removing hydrogen sulfide from the sour gas and a unit for converting this hydrogen sulfide to sulfur. Also installed are a steam plant, a water-softening unit, sulfur-storage and loading facilities, together with the necessary warehouses, control laboratory, office building, and auxiliaries. Removal of hydrogen sulfide and carbon dioxide is by a Girbotol unit. This operation is performed in the following steps:

1. Absorption of hydrogen sulfide and carbon dioxide in an aqueous solution of monoethanolamine.

2. Heating the solution to remove the absorbed gases, thus reactivating the solution.

3. Cooling and recirculating the solution for further absorption.

The unit for converting hydrogen sulfide to sulfur was designed by Foster Wheeler Corp. Local contractors prepared the plant site and C. F. Braun Co. erected the plant.

The new Worland sulfur-extraction plant is designed to process 30,000,000 cu. ft. of sour gas per day. It is connected to all of Pure Oil Co.'s wells. After hydrogen sulfide removal the sweet gas is sent to Pure's gasoline plant.

Residue gas from Pure's plant is equivalent in every respect to sweet natural gas. Part of this gas is used by Texas Gulf Sulphur and Pure as fuel. The remainder is available for industrial and domestic use in the area. A compressor station, erected by Montana-Dakota Utilities Co. near the sulfur plant, moves the sweet gas to a pipe-line system serving southern Montana.

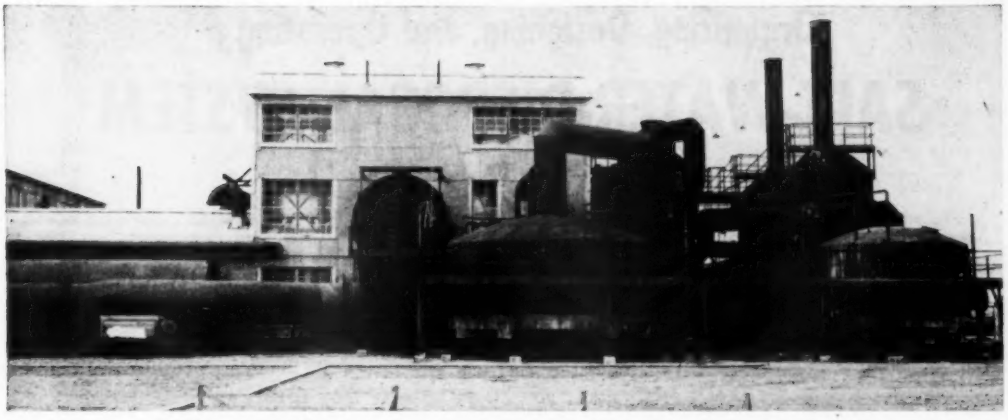
Plant Operation

The hydrogen sulfide removed from the sour natural gas is retained at the sulfur plant, subjected to a special catalytic process, and converted to elemental sulfur. This is then piped in the molten state to the stock piles. The recovery of sulfur is virtually complete as only a fraction of a per cent of it is lost in processing. The general processing steps employed are shown in the accompanying diagram.

H_2S extraction.—Sour natural gas from the field enters the bottom of the Girbotol absorption tower which is packed with Raschig rings. An aqueous solution of monoethanolamine enters the top of this absorber through a spray header and as it passes through the packing, counter flow to the sour gas, absorbs hydrogen sulfide and carbon dioxide.

Sweet natural gas leaving the top of the absorber is delivered to Pure Oil's plant.

Solution leaving the bottom of the absorber passes through a bank of



This view of the Worland sulfur plant shows one of the converters in center foreground.

heat exchangers where it is heated, and then into the top of a reactivating tower which is also packed with Raschig rings. From the bottom of this tower the solution enters reboilers and is heated further. The reboilers are the final stage of heating, and, at this point, due to its elevation in temperature, the solution has given up substantially all of its absorbed hydrogen sulfide and carbon dioxide.

This solution passes from the reboilers back through the bank of heat exchangers mentioned above and is cooled as it heats up rich solution coming from the absorber. The solution is further cooled by a bank of coolers and is then pumped back into the absorber.

Hydrogen sulfide and carbon dioxide released from this solution are piped to the sulfur-recovery plant.

Sulfur recovery.—The basic processing steps in converting the extracted H_2S to elemental sulfur are:

1. The hydrogen sulfide is burned with insufficient air so that sufficient hydrogen sulfide is left to react with the sulfur dioxide produced by the combustion to form sulfur.

2. The hydrogen sulfide and sulfur dioxide are passed over a catalyst to accelerate the reaction producing sulfur.

3. These gases are passed through a scrubbing tower and scrubbed with liquid sulfur to remove sulfur vapor from the gas stream.

After burning hydrogen sulfide in the reactor furnace, the hot gases are passed through a waste-heat boiler where the excess heat in the gases is used to generate steam. These gases are then passed through a catalyst bed where a chemical reaction ($2\ H_2S + SO_2 — 3S + 2\ H_2O$) which produces sulfur is accelerated. Gases which are now laden with sulfur vapor then pass through scrubbing towers.

Molten sulfur collected is piped from the bottom of the scrubbing towers to a collecting or run-down tank and the remaining gases, composed of water vapor and nitrogen, pass to the atmosphere.

Once a day sulfur collected in the rundown tank is pumped to the vat area where it is allowed to cool and solidify.

Field unitized.—Just how many tons of sulfur can be produced from the sour gas obtained at Worland from River Dome field is still a matter of conjecture. The field has just been unitized, thus insuring that the production of oil and gas, as well as sulfur, will be regulated to give maximum yields. Under this program the entire Worland field will be placed under centralized management and the high-gas-oil ratio wells will be cut back or removed from production in order to maintain the pressure energy in the oil reservoir.

This cutback in production will not only lengthen the life of the field but will result in greater total yield of oil over a period of time and will reduce the daily natural-gas production to a daily quantity that will not exceed the capacity of the sulfur-extraction plant. This program will result in elimination of all flares except during emergencies.

Reserves of sulfur are said to equal several million tons and at present rate of production the field may well last many years. The presence of sulfur in sour natural gas in other sources in this area has also been reported. By developing the recovery of sulfur from the sour-gas fields of this area, Texas Gulf Sulphur Co. thus materially adds to the country's reserves of sulfur and helps to insure customers of ready supplies of this valuable element.

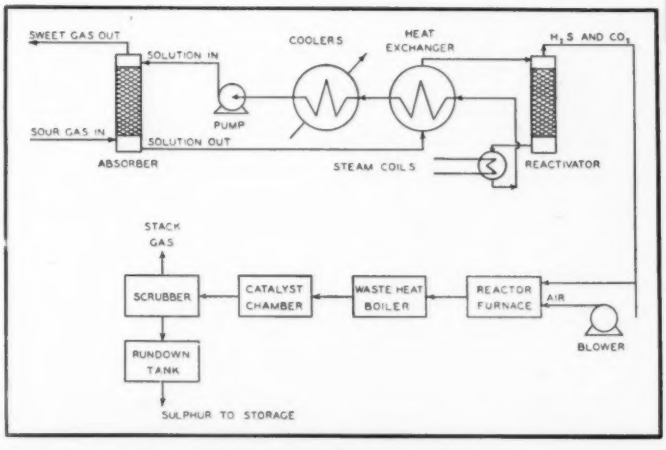


Fig. 1—Schematic flow arrangement of the H_2S extraction and sulfur conversion process operated by Texas Gulf Sulphur Co. at Worland.

Organizing, Designing, and Operating a
SALT-WATER-DISPOSAL SYSTEM

by Ivan M. Rice*

Potable water ranks first of all inorganic products, and it is vitally important to the health and economic well being of every person in the nation to help maintain the purity of natural water supplies. Oilfield brine, in many areas, contains certain chemical compounds which are corrosive to metals and injurious to plant and animal life. Proper subsurface disposal of salt water is, therefore, a conservation measure of the greatest importance to oil producers, farmers, industries, towns, and cities. The purpose of this article is to bring out the factors involved in organizing, designing, and operating salt-water-disposal systems.

JOINT participation in salt-water-disposal systems is practiced in order to accommodate water production from all the wells in a specified area at the least cost. Provisions for the system are set out in "Articles of Agreement" signed by all participating parties. It is good business to include as attachments to the articles of agreement the factors used in designing the system, since each member is entitled to know beforehand if the proposed expenditure will provide facilities adequate to meet his needs.

The complete design must be based on future maximum water production estimated from the number of wells to be connected. Plan and profile of the gathering lines should be included, as well as the construction plan of the disposal well, maximum possible disposal-well injection rate, and construction plans of the settling basin. This information enables each operator to determine intelligently whether the system is adequate to handle the water until all the producing wells are depleted.

Several accounting procedures have been used. However, the simplest one is where the system is 100 per cent jointly owned. Here, the gathering lines are installed to the receiving tank siphons, thus eliminating controversy regarding division of investment and responsibility for maintenance. The cost per producing well is simply determined by dividing the total investment by the total number of wells connected. Each operator can then determine how much his interest in the system will be.

Currently, the cost of an average system adequate to handle 500 bbl. of water per day per producing well will amount to $2,500 to $3,000 per well. This figure might well be compared to the investment cost for a pumping unit on the well, since both expenditures must be made if the well is to be produced.

After initial investment has been made, some expense is involved in operation. Again, the operating expense may be compared to the pumping unit, since operation and expense on both will continue as long as the well produces sufficient oil to pay the expense. Thus it is obvious that to produce a well where salt water is incident in the production of oil, the cost of disposing of that water must be recognized as a part of the investment and operations, the same as the pumping unit and engine.

Cost of operations, as provided for in the articles of agreement, is determined by dividing the monthly operating cost by the number of wells producing water, and billing each member for his proportionate part. Thus, while all wells connected share in the original investment and have disposal facilities available when they start producing water, they do not share in the operating expense until water is produced.

When everyone concerned is familiar with the terms of the agreement, an operator is selected to supervise the installation and maintain the system after it is in service. The operator assumes responsibility for maintaining the disposal well, settling basin, and gathering lines, and handles the necessary accounting work.

Great economies in disposal of oilfield brines in the proper manner can be accomplished by cooperation among the operators of producing wells. Adequate disposal facilities for all wells in a pool can frequently be provided by good engineering design and organization. Dissatisfaction and many operating problems result when a system "grows up" with a pool instead of being designed to meet specific requirements based on reliable data. The investment cost of a complete system will range from $35,000 to more than $100,000, and it is the most permanent installation in an oil field, because it must be operative until the last producing well is plugged.

Obligations of the members start on their individual leases with the operation of the producing wells and location and design of the tank batteries. In areas where salt water is almost certain to be produced sometime during the life of a lease, particular attention should be given to the location of the tank battery, in

*Rice Engineering Co., Chase, Kans.

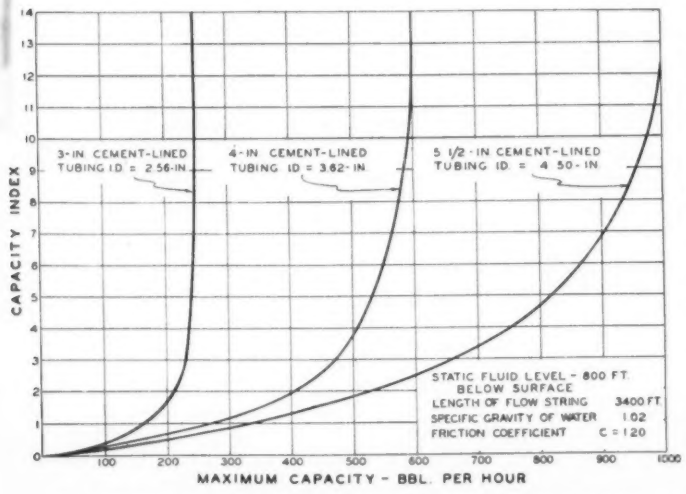

CAPACITY INDEX
MAXIMUM CAPACITY - BBL. PER HOUR
3-IN. CEMENT-LINED TUBING I.D. = 2.56-IN.
4-IN. CEMENT-LINED TUBING I.D. = 3.62-IN.
5 1/2-IN CEMENT-LINED TUBING I.D. = 4.50-IN.
STATIC FLUID LEVEL - 800 FT. BELOW SURFACE
LENGTH OF FLOW STRING 3400 FT.
SPECIFIC GRAVITY OF WATER 1.02
FRICTION COEFFICIENT C = 120

Fig. 1—Maximum capacity of salt-water-disposal wells for various size flow strings.

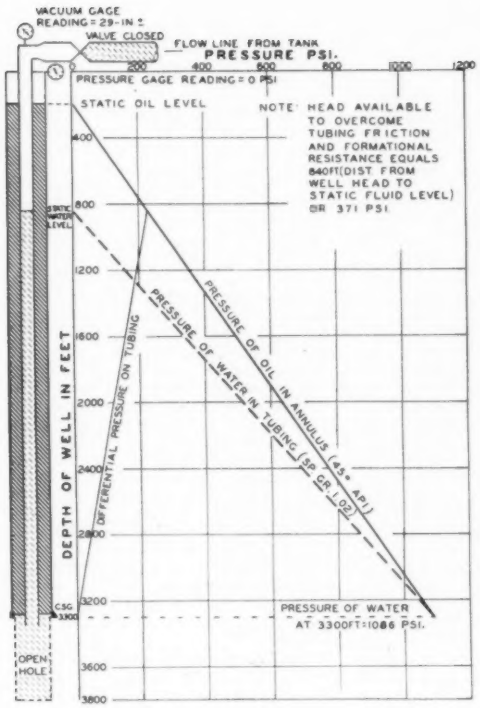


Fig. 2—Static conditions in disposal well.

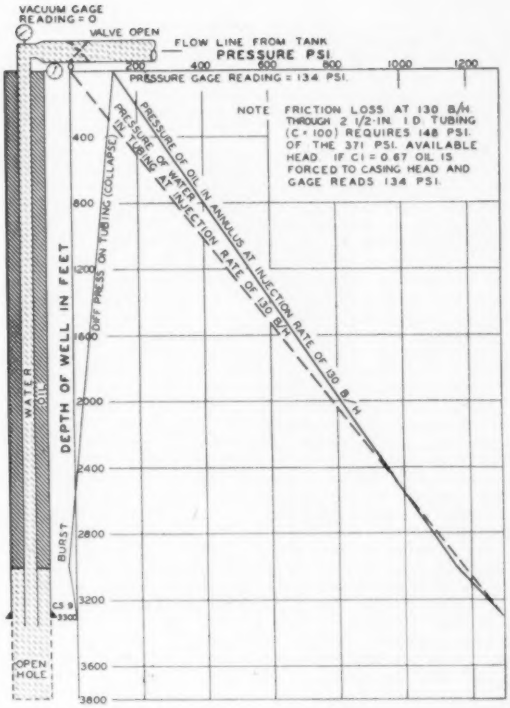

VACUUM GAGE READING = 0
VALVE OPEN
FLOW LINE FROM TANK
PRESSURE PSI
0 200 400 600 800 1000 1200
PRESSURE GAGE READING = 134 PSI.
NOTE FRICTION LOSS AT 130 B/H THROUGH 2 1/2-IN. I.D. TUBING (C = 100) REQUIRES 148 PSI. OF THE 371 PSI. AVAILABLE HEAD. IF CI = 0.67 OIL IS FORCED TO CASING HEAD AND GAGE READS 134 PSI.
PRESSURE OF OIL IN ANNULUS AT INJECTION RATE OF 130 B/H
DIFF PRESS ON TUBING (COLLAPSE)
PRESSURE OF WATER AT INJECTION RATE OF 130 B/H
WATER
OIL
DEPTH OF WELL IN FEET
BURST
400
800
1200
1600
2000
2400
2800
3200
3600
3800
CS 9 3300
OPEN HOLE

Fig. 3—Flowing conditions in disposal well.

order that water may gravitate from it. The receiving tank should be of adequate size and so designed as to completely separate the oil and water, since oil is as detrimental to a disposal system as salt water is to oil in the stock tank. If down time and operation expense are to be kept to a minimum, water must be delivered by gravity flow, free of oil and basic sediment.

When a system is to be designed, the prospective members should provide the designing engineer with the following data

1. Total number of wells to be provided for, including possible future drilling.

2. Estimated future daily water production, based on indicated capacity of present producing wells and capacity of producing equipment.

Planning a disposal system involves the selection of a disposal-well location, finding a satisfactory disposal formation, design of a settling basin, and layout and design of gathering lines.

Disposal Wells

Disposal wells are obtained either by recompleting an abandoned oil well or dry hole, or by drilling a new well from the grass roots. The chief advantage in using an abandoned oil well is the fact that casing, which has been cemented in the hole, can be utilized. The disadvantages are (1) the expense of drilling deeper is frequently almost as great as the cost of drilling a new well, (2) the casing is often too small to accommodate tubing large enough to furnish adequate capacity, and (3) many times the well is unsatisfactorily located with respect to the topography of the area. By drilling a well from the grass roots, the proper size casing and tubing can be predetermined, assuring adequate capacity; and the best location can be selected, to provide convenience and permit minimum size gathering lines to be installed.

In selecting the well location, both the topography and the geology should be considered. A study of the area should first be made to determine whether or not there is sufficient formation of satisfactory character available to assure disposal. When it has been established that a good section is available, the maximum quantity of water to be disposed of should be estimated and expressed in barrels per hour. The size tubing to handle this amount of water can then be selected by referring to Fig. 1, which shows the maximum injection rate for flow strings commonly encountered. The size casing to install is then only dependent on the smallest size that will safely accommodate the tubing.

The well should be drilled in the conventional manner, except that a full-size hole should be drilled to the bottom of the porous zones, and then casing should be set and cemented at a point below any possible producing horizon. After cement has set, cable tools should be used to drill out the plug, scratch the mud from the walls of the hole, and swab the well until it is clean. The well should then be acidized with at least 2,000 gal. of 30 per cent acid, so the well will be in the best possible condition before water injection is started. An accurate injection test, using a bottom-hole pressure gage, should be taken at this time, to determine whether or not the well has sufficient capacity to justify installing the remainder of the system. If it will not handle the estimated ultimate production, the proposed gathering system should be revised to include only the leases that can be properly accommodated.

The entire success or failure of a disposal well depends on the quality of tubing and the care exercised in running it. New corrosionproof tubing should be used, and the joints should be carefully sealed, because one weak place in the string might mean ultimate loss of the complete tubing

string or even in loss of the well. Wells equipped with new cement-lined tubing have been in continuous operation for 10 years, and have taken over 30 million barrels of corrosive water without showing evidence of a tubing leak and without having been cleaned out.

Experience has shown that packers are subject to corrosion and constitute a hazard when used to seal the annular space between the tubing and casing. It has been found that protection to the tubing and casing can be secured by using oil or naphtha in the annulus. Figs. 2 and 3 illustrate the static and operating conditions of a well so equipped.

It can be seen that a full string of tubing must be used to protect the casing. The fluid columns balance as long as the well is shut in. However, as water is injected, fluid level in the tubing rises due to the formational and tubing resistance to flow. The formational resistance is reflected as pressure on the oil in the annulus. The amount of resistance can be determined with a pressure gage on the casing head.

Once the casing pressure has been determined for a given rate, any increase in pressure for the same rate thereafter means the formation is becoming plugged. If the rate increases and the pressure decreases, the formation capacity has increased; but if the rate decreases and pressure decreases also, more head is lost in tubing friction, which indicates scale accumulation in the tubing. A sudden loss in pressure indicates a leak, which has resulted in the loss of oil. If the person in charge of the disposal system will check the casing-head pressure at least bi-monthly and keep a continuous record of the pressure, the need for reconditioning work can be quite accurately predicted several weeks in advance and tubing or casing leaks detected soon enough to prevent extensive damage.

The line from the pit to the well should be large enough to completely fill the tubing regardless of formational capacity. If the well shows a vacuum, it merely means the suction line is not large enough to supply the well with water. There is no correlation between well-head vacuum and formational capacity, since the presence or absence of vacuum is entirely dependent on tubing size and flow line size.

The receptivity of a disposal well depends on the porosity and permeability of the formation. The head available to force water through the tubing and into the formation is dependent on the distance from the surface to static fluid level. The capacity index or measure of effective permeability of the formation, is the barrel per hour increase in injection rate per pound per square inch increase in bottom-hole pressure. This is, in reality, the reverse of productivity index on a producing well; and, like the productivity index, the points (pressure vs. injection rate) usually fall on a straight line on plain coordinate paper, simply because the capacity of the equipment does not closely approach the formational capacity. At high injection rates through large flow strings, a curve is obtained instead of a straight line, because the formation permeability channels act as fixed orifices, which result in friction losses comparable to losses through injection strings or pipe lines.

Reconditioning disposal wells is confined to cleaning out, acidizing, and cleaning the tubing. Deposits of solids in the tubing or formation are invariably located at points where the velocity of the water has been decreased sufficiently to cause the suspended material to be dropped. The value of reliable test data and their correct interpretation lies in deciding what steps must be taken if the disposal well fails to handle water production, since guess work might involve pulling tubing and cleaning out with cable tools at a cost of $4,000 to $5,000, while a $1,000 acid job might solve the difficulty. On the other hand, a $1,000 acid job might be wasted in experimenting, if the well actually needs some other type of work.

The logical way to keep solid material out of the disposal well and

(Continued on page 93)

Fig. 4—Plan and profile of disposal-system layout.

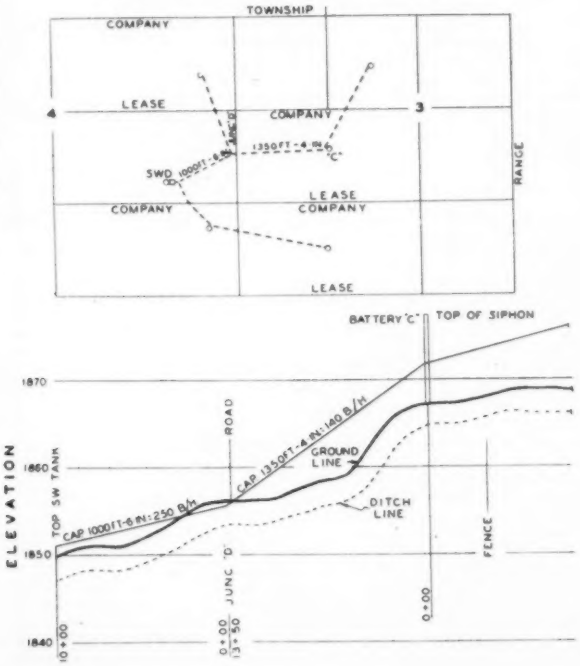
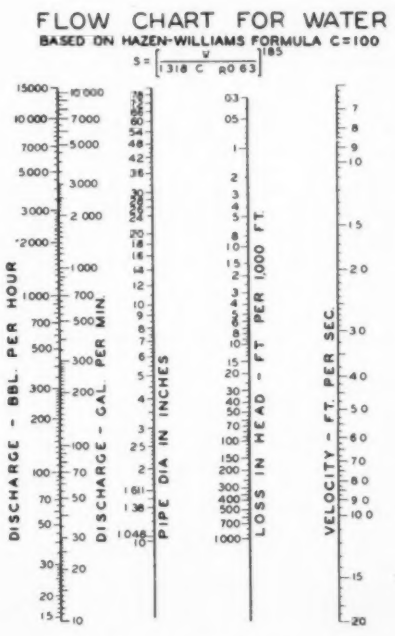


Fig. 5 — Alignment chart for determining water flow rates.


FLOW CHART FOR WATER
BASED ON HAZEN-WILLIAMS FORMULA C=100
S = [V / (1.318 C R^0.63)]^1.85
DISCHARGE - BBL. PER HOUR
DISCHARGE - GAL. PER MIN.
PIPE DIA IN INCHES
LOSS IN HEAD - FT PER 1,000 FT
VELOCITY - FT. PER SEC.

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Now it is possible for only one gauger or operator to obtain accurate (within ⅛") continuous gauge readings from any one or a series of tanks simultaneously. The operator needs no special electronic knowledge to maintain or service the "Varec" unit as all parts are of standard plug-in design.

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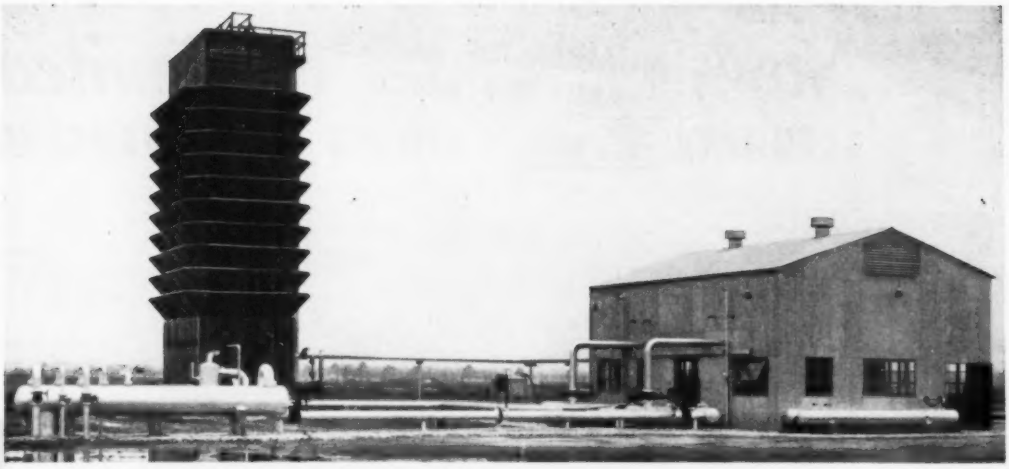
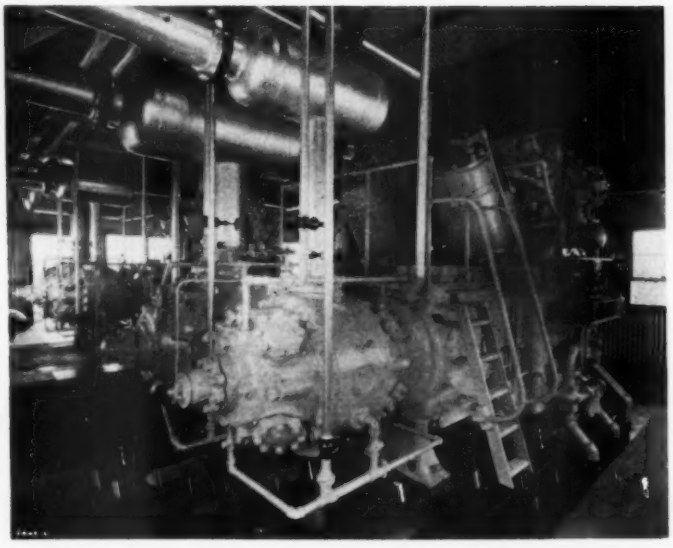


View of Universoil, Inc.'s, new automatic gas-booster plant in West Beaumont field, Texas. This plant takes gas from wells in the field, and, through two-stage compression, builds up pressure from 25 to 425 psi. It then enters the pipe-line system of United Gas Pipe Line Co. Inlet scrubbers below cooling tower at left are equipped with low-liquid-level dump and shutdown controls.

One-Man Automatic Gas-Booster Station Aids Conservation

in West Beaumont Field



Interior view of Universoil, Inc.'s, automatic gas-booster plant. These compressors, which handle 4,800,000 cu. ft. of gas daily, are equipped with protective shutdown devices and varispeed governors.

THANKS to a new automatic gas-booster plant installed in West Beaumont, Tex., field by Universoil, Inc., Tulsa, 4,800,000 cu. ft. of natural gas which ordinarily would be flared is now being utilized daily in the pipe-line system of United Gas Pipe Line Co.

This is but one of the many projects which are being designed to process gas formerly flared into the air, and the broad conservation program is expected to have far-reaching effects in natural-gas conservation.

But conserving flare gas alone is not the unusual feature of Universoil's plant. It is the feature of automatic operation, which makes possible a "one-man compressor," that makes the installation unusual.

Only one man each 24 hours is required to run the compressor station, and the nearest headquarters is a company house 150 ft. from the station building.

Gathering system.—Gas is gathered from wells through a 30,000-ft. gathering system. The fuel enters Universoil's plant at 25 psi., and, through two-stage compression, is boosted to 425 psi., after which it enters the pipe-line system of United Gas, where it is mingled with other natural gas.

The compressor station is equipped with two 440-hp. compressor units. Variable-speed governors are featured on the compressors, since wells in the field are on gas lift intermittently, and the load varies widely.

Other features of the installation are the protective shutdown devices which regulate temperature of cooling water and oil pressure. Inlet scrubbers are equipped with low-liquid-level dump and shutdown controls.

The complete installation was erected jointly by Deerfield Petroleum, Inc., and Universal Petroleum Co., Tulsa, and Oil Well Supply Co., Dallas, furnished all equipment.

PETROLEUM CHEMICALS DIVISION
NEWS

July ★ One of a Series of Interest to the Petroleum Industry ★ 1951

Next Du Pont Gasoline Survey Due Week of July 23

Refiners will start getting results of the latest Du Pont Quarterly Nation-wide Gasoline Survey on July 23.

Because interest in octane numbers is running high, this issue of the survey has been eagerly awaited.

As an indicator of trends, many refiners will find it of particular value.

AFTON D. PUCKETT
Translates Lab Work Into Technical Service

Afton D. Puckett coordinates the operations of the five district laboratories of the Du Pont Petroleum Chemicals Division in their performance of technical services. He also supervises technical work connected with the quarterly Motor Gasoline Survey.

After receiving a chemical engineering degree from Oklahoma A & M College in 1936, Mr. Puckett became an engineer for the Tide Water Associated Oil Co. From 1941 to 1946 he served as fuels chemist and petroleum engineer with the National Bureau of Standards. He then worked on diesel fuel problems at the U. S. Bureau of Mines Petroleum Experiment Station at Bartlesville, Okla.

In 1947 Mr. Puckett came to Du Pont to take charge of the studies of antiknock properties of motor fuels in the Du Pont Combustion Engineering Laboratory at Deepwater Point, New Jersey. He is the author of several technical papers on combustion characteristics of motor and diesel fuels.

Fast Legwork, Synchronized Teamwork Make Du Pont Gasoline Survey Accurate and Up-To-Date

To be of interest and value to you, the news in your daily newspaper must be always fresh. The same is true with the Du Pont Quarterly Nation-wide Gasoline Survey which shows, by areas, the national trend in gasoline octane ratings and tetraethyl lead content.

Survey samples are purchased by Du Pont representatives at the islands of service stations with active turnover.

The whole survey operation – from sample collection to delivery of published results – is completed in 3 weeks or less. Working on such a tight schedule takes highly synchronized teamwork. And fast legwork, too.

For efficiency, one man is generally responsible for the whole sample collection in an area. But it's a big job – and speed is imperative. In each of the five districts, from 100 to 175 individual samples are collected . . . all within 48 hours.

Dave Rickard, for example, flies many air miles every 3 months to pick up gasoline at 24 service stations in Denver, Colo.; Casper, Wyo.; Great Falls, Mont. and Aberdeen, S. D.

To enable the Du Pont representative to make his rounds at top speed and efficiency, the sample cans are tagged ahead of time. And they are already waiting for him at the express office when he arrives in the cities on his route.

Extreme difficulties often have to be overcome to meet the schedule. An unusually heavy snowstorm dealt a tough problem to Herb Cissley. He had to get his car, which was securely snowed-in, out of his garage in a hurry. He finally had to hire a bulldozer to plow out the driveway. Some of the driveway surface got misplaced – but he made his collection on time.

Both the sample towns and the gasoline brands are carefully selected. Source of supply and position in marketing area dictate the choice of cities. The brands picked are believed representative of the range of quality in the area. All samples are obtained from service stations appearing to have a reasonable turnover. And to assure a uniformly accurate trend, the same sta-

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

PETROLEUM CHEMICALS DIVISION
NEWS

CONTINUED *Gasoline Survey*

tions are generally sampled for each survey.

Only a few hours after samples leave the marketers' islands, they are being evaluated. Each of the five Du Pont District Laboratories shares in this work. Here they are tested for both motor and research octane ratings, as well as lead content.

Working at top speed—checking and rechecking for accuracy – the laboratory staffs take only about a week to test nearly 700 individual samples, both regular and premium.

As soon as possible after collection, samples are rushed to the nearest district laboratory.

While the testing is being done at the district laboratories, the Wilmington staff is getting in gear for the big push of compiling, printing and mailing the results. To save printing time, as many of the forms as possible are set up before printing deadline. Only the final results have to be added at the last minute.

In addition to the regular survey report, a running account of current trends in eight strategically located cities is published in graph form. These bar graphs show the average results of all Du Pont quarterly surveys since 1948 in Philadelphia, Detroit, Chicago, Tulsa, Houston, Denver, Los Angeles and San Francisco. The graphs are brought up to date with last-minute information for each publication of the survey.

The survey is one of the Du Pont services available to refiners and marketers. When the next issue reaches your desk, it can be extremely valuable to you in planning your marketing activities . . . with its *timely, accurate* picture of nation-wide conditions.

"DULUX" TANK WHITE SPECIALLY FORMULATED FOR GASOLINE STORAGE TANKS

Like many other Du Pont products, "Dulux" Tank White was formulated by Du Pont paint chemists especially with the petroleum industry in mind. In developing a finish that would be suitable for gasoline storage tanks many factors had to be taken into consideration.

Perhaps the greatest single contribution of "Dulux" Tank White is the savings it effects through cutting down gasoline evaporation losses from the tanks. This is made possible by the special combination of pigments used in its formulation, which assures the whitest possible white, and the maximum of light and heat reflection.

In "Dulux" Tank White, excellent surface protection is imparted by the famous "Dulux" resin which resists cracking, checking and loss of adhesion.

"Dulux" resin, too, slows down the wearing process of the paint . . . gives it a high degree of durability over long periods of time.

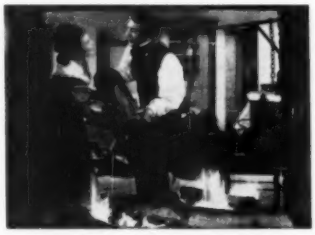
Another important quality of "Dulux" Tank White is its unusual resistance to the fumes generally found in refinery locations.

A self-cleaning characteristic of this paint tends to keep a tank farm looking its bright and shining best for long periods of time. It also preserves the light and heat reflective qualities of the finish at a high level.

Du Pont Movie Library Available to Oil Co's

Movies are playing an increasingly important role in industry . . . as selling tools, as personnel relations aids, and for explaining highly technical subjects simply and dramatically.

The Du Pont Petroleum Chemicals Division has now set up an extensive library of movies that have particular interest to the Petroleum Industry.



A scene from "The Du Pont Story." This dramatic, technicolor movie emphasizes progress through research—traces the history of the Company from its beginnings.

From automotive maintenance to safety . . . from farming to factory "color conditioning" . . . from the prehistoric formation of oil to the properties that make a modern gasoline . . . these movies cover a broad variety of subjects related to petroleum and its uses. Films made for the U. S. Bureau of Mines and various petroleum companies, as well as Du Pont films, are included.

These films are available to you for your own use. And you can obtain a complete listing of the library from the nearest Du Pont Petroleum Chemicals Division District Office.

LITERATURE AVAILABLE

The following is a partial listing of free Du Pont bulletins, reports, booklets and aids available to you. Address request to your nearest Du Pont Petroleum Chemicals Division District Office.

Du Pont Gasoline Antioxidants Nos. 5, 6 and 22—describing their use and application for improving gasoline storage stability . . . . . Serial A-513

Blending calculator for Du Pont TEL Compound (Aviation Mix) . . . . . Serial A-1210

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A-2170

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Aluminum's Role in Refinery Equipment

Tests indicate suitability of this metal for various types of service. Often it is less expensive. Care must be exercised in the design stage in order to reduce galvanic attack between aluminum and other metals.

by E. E. Kerns* and W. E. Baker*

ALUMINUM is of considerable interest to the petroleum refiner because of a number of its properties. It is resistant to corrosion by sulfides, ammonia, organic acids, and furfural.

On the debit side, aluminum is anodic to most of the other common materials of construction or their salts. Hence it is necessary to design installations so that certain ions—such as lead, copper, mercury, and chlorides—are not present, for their presence causes rapid attack of aluminum.

Although the corrosion resistance of aluminum is of most interest here, the other properties should not be completely ignored. Aluminum is, of course, light in weight. This is perhaps best illustrated by considering that a 16-ft. tube bundle with a diameter of 36 in. weighs about 12,000 lb. if constructed of a steel skeleton and brass tubes. In aluminum, this same tube bundle would weigh about 4,000 lb. The greater ease of handling is apparent.

Aluminum also has excellent heat-transfer characteristics. Undoubtedly this fact is associated with corrosion characteristics, as will be shown later. Other physical and mechanical properties are discussed, together with their effect on equipment design by Plummer,[1] and need not be repeated here. For convenience, Table 1 sets forth the chemical composition and typical mechanical properties.

Storage Tanks

Probably the most notable installation of storage-tank roofs has been made by Humble Oil & Refining Co. The details of construction and comparisons with other methods of construction have been published previously by Camp[5] and Plummer.[1] Experience to 1950 of these roofs, which are in run-down-tank service, shows that 19 of the 27 are still in service.

Of these 27 roofs, 21 have required repairs and protection at points where aluminum contacts steel. Such protection has been attained by the installation of reinforced gunite at these points. Three roofs were renewed with gunited steel roofs because they had been subjected to severe galvanic attack. Five other roofs were retired from service.

Tank accessories.—We have had satisfactory results in most cases with vent valves and flame arresters of aluminum construction. This experience is confirmed by Harnsberger,[7] although he mentions that a phenolic resin material is being substituted to a large degree for aluminum parts in vent valves.

Vessel internals.—Aluminum pressure vessels apparently have not been used to any great extent. We are currently testing aluminum bubble caps in crude distillation, thermal cracking, and furfural refining processes. We do not have sufficient data to evaluate the usefulness of aluminum in these services.

Instrument-Air Tubing

In our company, tests were started on aluminum instrument tubing because of the economic advantage. Copper tubing may cost 60 per cent more than aluminum tubing. The cost of aluminum fittings is about the same as brass, and we believe aluminum fittings will be cheaper in the future.

The corrosion conditions are determined essentially by the atmosphere in which the installation is made. Ordinarily, in our Sohio refineries, the instrument air is dehydrated before it is put into the system. Consequently, no corrosion is expected internally. The one other circumstance which is likely to lead to corrosion is the so-called poultice action, which is likely to occur where tubing it put into racks and where wood spacers are used to separate the various tubes. Care must be taken that there are no points where moisture can collect and remain against the aluminum tubing.

As a result of tests, Lepley[8] reports that his company expects to use aluminum except where there is concentration of acid fumes or in important refining units where the possible failure of instrument lines might result in serious upset to operation. This is subject to future revision. We are also using aluminum in part of our newer units.

Insulation—Weatherproofing

Aluminum has been used for the weatherproof jacketing on insulation by many refiners. For the most part such installations have been satisfactory. However, in those cases in which asbestos-cement or 85 per cent magnesia insulation has had an opportunity to become damp, rapid corrosion of aluminum can be expected. This is because portions of the cement or magnesia are soluble in water and are alkaline.

The use of aluminum offers an economic advantage, because 28-gage sheet metal in galvanized iron costs 6.6 to 7.0 cents per square foot, whereas aluminum of the same gage costs 5.3 to 6.2 cents per square foot.

In some of our operating units corrosion of galvanized iron is very severe. Part of this can be blamed on the quality of the galvanized sheeting; part of it can be blamed on the hydrogen sulfide from the unit; and part on the severe industrial atmosphere. Galvanized iron shows rust streaks in 2 to 3 years.

From the results of our tests, we believe that aluminum is satisfactory as insulation weatherproofing in most instances. It is not satisfactory, however, when used over wet magnesia insulation. Our tests are fairly well corroborated by the results of others. Harnsberger[7] has indicated that his company's experience with aluminum has not been satisfactory because of

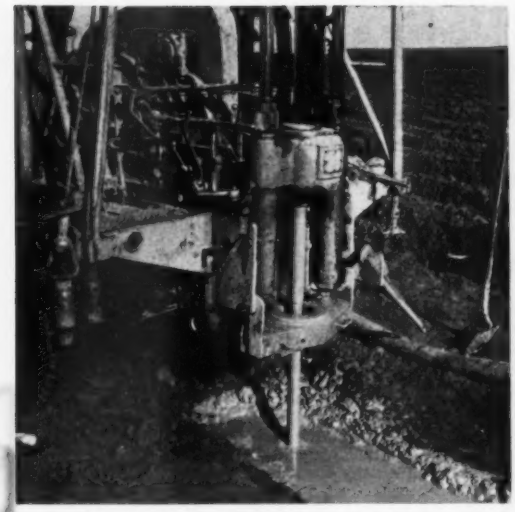
(Continued on page 98)

*Standard Oil Co. (Ohio), Cleveland. Portion of paper presented at A.P.I. Division of Refining meeting, Tulsa, May 1951.

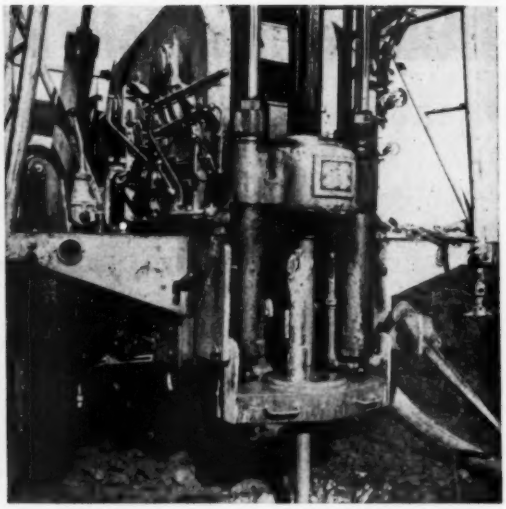
TABLE 1—NOMINAL COMPOSITION AND TYPICAL MECHANICAL PROPERTIES OF ALUMINUM ALLOYS

Alloy and temper	Alloying elements						Mechanical properties		
	Copper	Silicon	Manganese	Magnesium	Zinc	Chromium	Tensile strength (psi.)	Yield point (psi.)	Elongation in 2 in. (per cent)
2S—H14	....	....	....	....	....	....	17,500	15,000	9
3S—H14	....	....	1.2	....	....	....	21,500	19,000	8
4S—O	....	....	1.2	1.0	....	....	26,000	10,000	20
24S—T4	4.5	....	0.6	1.5	....	....	68,000	48,000	19
52S—O	....	....	....	2.5	....	0.25	27,000	12,000	25
61S—T6	0.25	0.6	....	1.0	....	0.25	45,000	40,000	12
63S—T6	....	0.4	....	0.7	....	....	35,000	30,000	12
72S	....	....	....	....	1.0	....	33,000	15,000	17

Note: Alclad 3S is a 3S core with 72S cladding.



Sandy drilling has thickened the drilling mud at this Ralls, West Texas, shot hole. Thinning of the mud was required several times in a 180-ft. hole. Sandy drilling causes trouble generally.



This shot-hole rig with a 5 by 6 pump is equipped with "N" rods for drilling. Elimination of tool joints is frequently advantageous in drilling gravel and also permits easier drilling of a very small hole.

Influence of Hole Size In Shot-Hole Drilling

by Earl Weaver

At all times the driller should use the smallest bit he can so as to effect maximum rate of penetration with drill weight available. With proper selection he can double his production in soft and hard shale.

This pile of clean cuttings was produced by a 4¼-in. bit. The cuttings are not sticky nor have they balled the bit or wall packed the hole.

THERE are many problems involved in drilling shot holes, each with its own typical characteristics. Experiences of drillers as they encounter different formations in various areas bear out this statement. Drilling problems may sometimes be difficult to determine due to the fact that it may be either of a general nature or a particular individual one.

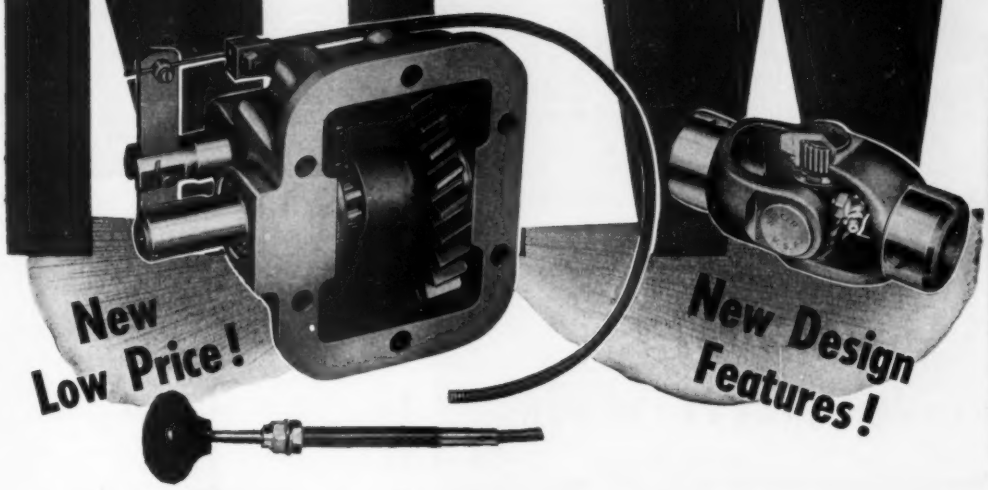
A general problem could be defined as one which is common to all drillers, regardless of type of drilling equipment and driller's experience. As such it eventually becomes well known and has a well-known solution.

A particular individual problem may be defined as one which may be overcome by changes in equipment or by the driller's learning through experience how to overcome his difficulty.

To differentiate between the general and the particular problem when trying to find a satisfactory solution is especially difficult. General drilling difficulties in areas where water loss is high are well known and occur regardless of the equipment and may be solved through the use of artificial mud and bran. The technique of drilling in areas where water loss is high is a particular phase of the general problem and the experience of one driller may cause him to obtain more production than another.

A particular individual problem may be demonstrated in the case where a heavy drill is working alongside a light drill, such as a heavy drill with tool-joint pipe and a 6 by 6-in. pump as compared with a light drill using end rods and a 4 by 5-in.

NEW



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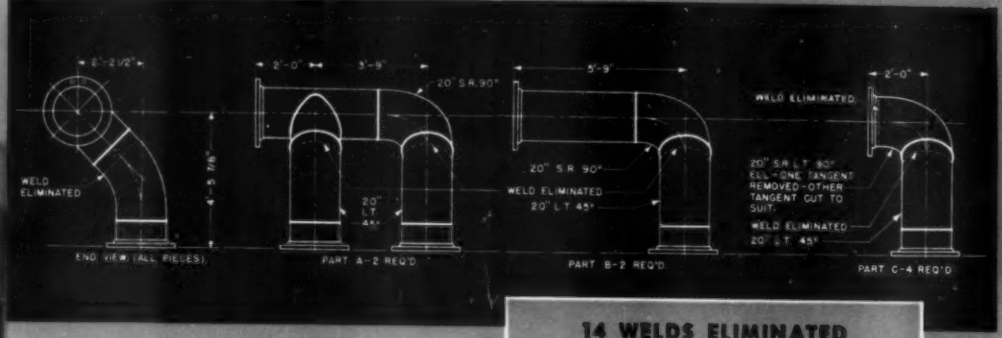

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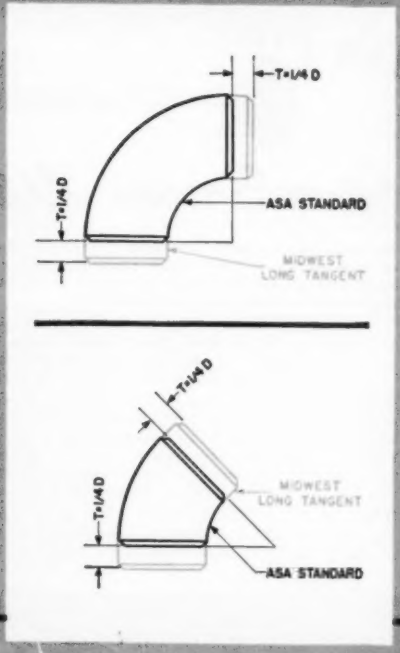
Other advantages of Midwest "Long Tangent" Elbows: pipe and fitting lined up more quickly and accurately, weld is removed from point of maximum bending stress, can be sleeved, slip-on welding flanges are more easily used, and they cost no more than standard elbows usually furnished. Ask for Catalog 48.



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THE AUTHOR

Earl M. Weaver, vice president of Herb J. Hawthorne, Inc., Houston, has been closely associated with the drilling industry for the past 16 years. A graduate of Rice Institute, Houston, where he received his B.S. degree in electrical engineering in 1935, Weaver became a registered professional engineer in 1939. Weaver was associated with Gray Tool Co., Houston, for 13½ years, where he served as chief engineer. Three years ago he joined Herb J. Hawthorne, Inc., as vice president.

Paper presented at the A.P.I. spring 1951 meeting, Pacific Coast District, Los Angeles.

pump. In hard drilling the heavy drill can produce more footage due to the fact that it can place more weight upon the drilling bit. The light drill will be advantageous because it can use a much smaller bit than a large drill. Thus at times it may equal or approach the footage of the heavy drill.

There are many other differences in equipment which present advantages in one case and disadvantages in another. At times these differences may compensate each other and produce similar results. The essential differences besides weights of the drills, type of drill rods, and size of pumps are ease and speed in making a round trip, ease in coming out of the hole and laying down the rods in doubles, ease in "rodding" up and going back in the hole, size of the hole, etc.

Hole Size in Sticky Shale

The effect of the size of the hole when drilling hard, sticky shale is a subject of particular interest. This is a general problem with some particular aspects which are affected to a small degree by different types of equipment and driller's experience.

The author has witnessed the drilling of 4¾ and 4¼-in. holes with three different manufacturers' rigs in several parts of Texas. This included the use of "N" rods, tool-joint rods, 4½ by 5-in. pumps, 5 by 6-in. pumps, and 5½ by 6-in. pumps on all kinds of combinations on nine drills in three different areas. (See Table 1.)

Typical red-bed formations prevalent in West Texas are well known as being most extensive north and south of the east-west highway from Big Spring. Typical drilling in this red bed shows a small amount of surface limestone or caliche or sandstone, depending upon the particular location. Red beds are very thick when such holes are drilled from 100 to 200 ft. deep. The upper 100 ft. of such drilling includes alternate thin sections of sandy shale, sandy clay, sandstone, gravel, cemented gravel shale, and the remaining part of the hole becomes the typical hard, dry, red-bed shale that becomes very sticky as soon as it contacts with water.

In an area visited northeast of Stanton, 4¾-in. holes were being drilled. The drills were heavy equipment with 4½ by 6-in. pumps and with 3⅜-in. o.d. tool joints. With such equipment and because of the tool joints, it had been deemed advisable to drill 4¾-in. holes. Typical drilling conditions resulted in a considerable amount of wall packing in the kelly part of the hole for the first 20 ft. As drilling progressed to about 100 ft. and the driller encountered the hard, dry shale, the drilling slowed down considerably and the increase of weight upon the bit did not improve the speed of drilling.

Tests were made with extremely large water-course bits and small water-course bits in the 4¾-in. size. There was considerable balling up on the bits of the 4¾-in. size causing thickening of the mud, consequent wall packing, and slow drilling. As drilling progressed with the 4¾-in. bits it was noted that the cuttings were sticky, adhered to each other, and many chunks of mud from the

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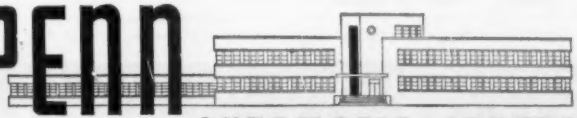

AUTOMATIC CONTROLS

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wall of the hole frequently came loose upon reaming and were washed out of the hole.

With the running of 4½-in. bits, drilling conditions were so greatly improved that the drilling time was practically cut in half, there was no wall packing and no balling of the bit even with a large water course. Cuttings came out of the hole clean and not adhering together and there was considerably less need for thinning the mud. The results were conclusively demonstrated by the loader since the 4¼-in. hole allowed the dynamite to fall to the bottom of the hole.

South of Ralls, which is east of Lubbock, the author observed the drilling of 4¼ and 4¾-in. holes where 3-in. dynamite was used. There was no particular amount of sticky red bed present in this area. However, the drilling of 4¾-in. holes had been thought advisable due to the use of the large-size dynamite. The effectiveness of even the 5 and 6-in. pump was greatly reduced because of the sandy nature of the clay, shale, and sand being drilled, which made the mud so thick that drilling was sometimes difficult.

At times there was considerable balling up and wall packing which slowed down the drilling in both rate of penetration and length of time required to ream the hole in order to remove the wall packing. Subsequent use of 4¼-in. bits gave good results, greatly reducing all of the previous trouble. However, the improvement of drilling conditions was sometimes obscured due to unusual thickening of the mud as a result of the tremendous quantity of fine sand which would not settle out upon recirculation.

Another instance came to the author's attention as a result of drilling shot holes near Huntsville, Tex. The shooting required that the hole be cased as soon as it was drilled. In this work 4½-in. bits had been used and great difficulty was experienced in running the casing to the bottom of the hole. With subsequent use of 4-in. bits the hole was much cleaner and the casing was easily run to the bottom of the hole.

Pump Size a Factor

The wall packing of holes is a condition which is affected to some degree by the size of pump, and it is generally accepted that a large pump will give better results than a small pump in all areas. Apparently the drilling of the extremely dry or sticky shale of the red beds in West Texas is of such nature that there would have to be an increase in capacity of 30 per cent in the size of the prevailing pump. However, this has proved not at all necessary since excellent results can be obtained by merely reducing the size of the hole. A 4¾-in. hole produces 25 per cent more cuttings than a 4¼-in. hole (see Table 2) so that with a fixed pump capacity there is a higher percentage of cuttings per unit volume. Velocity of the return of the cuttings with a 2⅜-in. o.d. drill rod in a 4¾-in. hole is 36 per cent slower than the velocity in a 4¼-in. hole. Thus it appears evident that a small change in hole size can greatly affect drilling conditions.

In the Stanton area, as previously stated, the cuttings upon returning to the top of the 4¾-in. hole were sticky and adhered to each other, whereas the cuttings returning from a 4¼-in. hole were clean and separated. As soon as these clean cuttings rested together for several minutes they, too, became sticky. Consequently it may be said that the rate of return of the mud circulation with its cuttings is very important and it is evident that this may be interpreted as meaning larger pumps are necessary. This is true, but is far from being recommended since the increase in velocity of the returns is easily obtained by merely reducing the size of the hole (see Table 4).

It was evident that the size of the water course had little to do with the balling of the bits and the wall packing in this particular drilling. However, the small water course remains open to function even though the bit balls up in the 4¾-in. size.

Since the 4¼-in. holes were drilled more satisfactorily than the 4¾-in. holes, it is evident that the rate of

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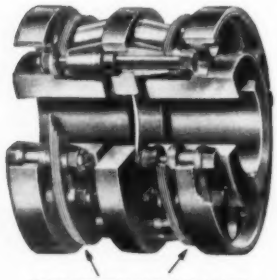

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penetration was much greater and produced more cuttings per unit of volume than had the 4¾-in. bit by the elimination of balling and wall packing. The particular reasons for this situation are not readily explainable but are obviously related to the velocity of cutting returns and the density of cuttings in the mud.

Clean Hole Is Objective

The above results show that it is much better to have a 4 or 4¼-in. clean hole that is actually a 4 or 4¼-in. loading size than to have a 4½ or 4¾-in. hole that is wall packed and results in actually a 3¾-in. or smaller loading size. Some drillers use 3½ and 3¾-in. bits with "N" rods with excellent results. It is not intended to cover the problems in drilling broken, hard formations, gravel and boulder formations, or other conditions with such wide variations where 4¾-in. and even 5-in. hole sizes are sometimes necessary. Under such conditions stickiness of drilling is seldom a problem. It is only necessary to get a clean hole that is not ragged and rough as is evidenced by the fact that many times tool joints will not easily pass some of the ragged parts of the hole.

In conclusion, it appears obvious that the dynamite size or the use of casing in sticky shale areas does not require the enlargement of hole sizes. Likewise, the use of tool-joint pipe does not require the drilling of a large hole. When wall packing is considered by many people they think that the drilling of a large hole will improve the conditions, whereas, the reverse is actually true.

It is the author's recommendation that all drills be equipped to use both large (4¾ and 5-in.) and small (4¼-in.) bits. In the event "N" rods are used, it is recommended that the driller consider 4, 3⅞, 3¾ and even 3½-in. blades. This is definitely an economical move which may appear at first hand to be an expensive investment. With the proper selection of bits, the driller can sometimes double his production in soft and hard shale drilling as outlined above. In questionable hard formation areas he will have the opportunity of using either 4¼ or 4¾-in. roller bits.

At all times, the driller should use the smallest bit he can so as to effect maximum rate of penetration with the drill weight available. Especially heavy drills can use 4¾-in. bits efficiently whereas the average drill can utilize a 4¼-in. much more effectively, and the light drill with "N" rods will utilize 3⅞-in. with maximum efficiency.

Where bit balling is encountered in shot-hole drilling, cuttings are sometimes much larger so that the slip velocity is higher. This means that cuttings are sluggish at times, can easily settle out, can start compacting in a fraction of a second, and give trouble if the return velocity of mud or water is too low.

Note that 3½ and 3¾-in. holes as proven on light drills show good return velocity. Also 4 and 4¼-in. are good hole sizes for the medium drill. Now note that it requires a 6 by 6-in. pump to give a high enough velocity for a 4¾-in. hole.

If a light drill customarily using 3⅞-in. bits gives a return velocity of 162 ft. per minute, 3½-in. bits would increase the velocity 47 per cent and 4¼-in. bits would reduce the velocity 25 per cent. With a medium drill customarily using 4¼-in. bits giving a return velocity of 174 ft. per minute, 3⅞-in. bits would increase the velocity 32 per cent and 4¾-in. bits would decrease the velocity 26 per cent. A heavy drill customarily using 4¾-in. bits giving a return velocity of 226 ft. per minute would find that 4¼-in. bits would increase the return velocity 36 per cent.

TABLE 1—GENERAL CHARACTERISTICS OF SHOT-HOLE DRILLS

Type of drill—	Weight of drill (lb.)	Size of pump (in.)	Bit sizes (in.)
Light	8,000	4½ x 5	3½-4
Medium	12,000	4½ x 6	4-4¼
Heavy	16,000	5 x 6	4¼-4¾

TABLE 2—HOLE AREA AND ANNULUS AREA

Hole diameter (in.)	Hole area (sq. in.)	Area of annulus with 2⅜-in. o.d. drill rods (sq. in.)
3½	9.62	5.19
3¾	11.04	6.61
3⅞	11.79	7.36
4	12.57	8.14
4¼	14.19	9.76
4½	15.90	11.47
4¾	17.72	13.29
5	19.64	15.21

TABLE 3—AMOUNT OF WATER REQUIRED TO FILL VARIOUS SIZE HOLES
(In gallons)

Size hole (in.)	Depth of hole (ft.) 60	90	120	150	180	240	300
3½	30	45	60	75	90	120	150
3¾	34.5	52	69	86	103	138	173
3⅞	37	55	73	92	110	147	184
4	39	59	78	98	117	157	196
4¼	44	66	88	110	132	177	221
4½	50	74	99	124	149	199	248
4¾	55	83	111	138	166	221	276
5	61	92	122	153	184	245	306

Note—A 5-in. hole takes 50 per cent more water than a 4¼-in. hole. A 4¼-in. hole takes 50 per cent more water than a 3½-in. hole.

TABLE 4—RELATIONSHIP OF RETURN VELOCITY OF CIRCULATING FLUID TO HOLE SIZE (ASSUMING 70 S.P.M. AND 80 PER CENT EFFICIENCY FOR PUMPS)

Size pump			4 x 5	4½ x 5	4½ x 6	5 x 6	6 x 6
G.p.m.			62	84	88	108	156
Size hole (in.)—	Hole area (sq. in.)	Annulus area (sq. in.)	Return velocities in feet per minute				
3½	9.62	5.19	238	274	326	402	580
3¾	11.04	6.61	180	214	256	316	456
3⅞	11.79	7.36	162	192	230	284	410
4	12.57	8.14	146	174	208	258	370
4¼	14.19	9.76	122	146	174	214	308
4½	15.9	11.47	104	121	148	182	262
4¾	17.72	13.29	90	106	128	158	226
5	19.64	15.21	78	92	112	138	198

Note: The figure of 200 ft. per minute has been demonstrated on large rigs as being very efficient. Reference is made to the 1948 Drilling and Production Practice of the A.P.I. on page 35, in the article, "Fluid Velocity and Rate of Penetration," by Nolley, Cannon, and Ragland. Cuttings in mud or water will settle out if the velocity is low. Reference to R. J. Pigott, "Mud Flow in Drilling," in Drilling and Production Practice of the A.P.I. 1941 gives formulas for the slip velocity of particles. The slip velocity in water of a round flat particle 0.5 in. in diameter, according to Pigott is 54 ft. per minute.

Salt-Water-Disposal System

(Continued from page 82)

reduce costly reconditioning jobs is to retain it in a settling basin before it reaches the well. Thus, each disposal system requires a pit or tank to skim off oil, provide sufficient storage to accommodate fluctuations in water production, and furnish adequate settling time. The type of tank or pit to use is a controversial subject among operators, and the cost is usually thoroughly discussed, although all factors may not be carefully considered. It is well to remember that the settling basin must be operative until the last producing well connected to it is plugged; therefore it should be constructed of permanent material, easy to repair if a leak develops, and should be of adequate size.

One cleanout job during the life of a disposal well would cost more in labor, material, and lost production than the difference between a poor installation and the very best. In most instances, it is also desirable to have the top of the accumulation tank only slightly above the level of the disposal-well head in order to provide the maximum head for the gathering lines, thus keeping their size and cost to a minimum.

If geological conditions are favorable and the disposal well is topographically low, the gathering lines can generally follow natural drainage patterns. A field survey of line locations and elevations is always

desirable, so a plan and profile can be prepared. Line junctions should be located at an accessible place, such as a tank battery or good road, rather than out in a field. If possible, a change in line size should be made at a tank battery, to assure a supply of water when cleaning lines. Scraper traps and full-opening valves should also be installed where necessary at line junctions to facilitate line cleaning.

The purpose in preparing line profiles is to determine their length, over-all difference in elevation between tank batteries and the accumulation vessel, and to be certain that the line does not cross the hydraulic gradient. Profiles also aid in locating line troubles, such as oil or air accumulation at high points. A plan of the lines is necessary to keep an accurate inventory of material and to aid in salvaging the lines after several years of operation and changes in operating personnel.

TABLE 1—PROPOSED SALT-WATER-DISPOSAL SYSTEM GATHERING-LINE DATA

		No. of wells		Bbl. per day per well	Head, ft.		Line		Bbl. per hour	
From	To	Actual	Provided for		Available	Friction loss	Size	Length	Req'd discharge	Capacity of line
D	S.W. Pit	10	12	500	4.5	4.5	6 in.	1,000 ft.	250	250
C	D	6	6	500	16.2	12.8	4 in.	1,350 ft.	125	140

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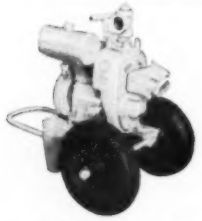

MODEL 24 2" PUMP 4 H.P.
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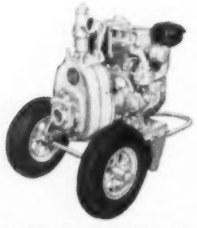

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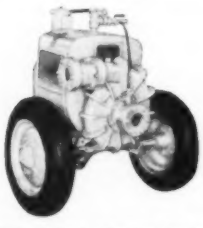

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Design of the lines, or selection of size, is based on estimated ultimate quantity of water to be handled, available head and friction loss. A careful study should be made of the producing wells in estimating future water production, because once the system is installed, an increase in line capacity is difficult to obtain.

While different friction factors are used in determining line sizes, experience has shown that a "C" value not exceeding 100 should be employed with the Williams and Hazen formula (see Fig. 5). A higher value for the C factor may be applied in calculations involving new corrosion-resistant pipe such as is in common use today but by the time maximum water production is reached this value is lowered appreciably by oil and scale accumulation. Maintenance of new smoothness in the pipe is practically impossible and certainly uneconomical.

Although the articles of agreement stipulate that the system will accommodate a given quantity of water per well it does not usually incorporate the basis of design. A standard method for calculating line capacities should be adopted by all designers so there may be no misunderstanding regarding the quantity of water that the system can handle. An example of this point is illustrated in a 500-bbl. per day per well system calculated with a C factor of 130. When the value of the C factor drops to 100 (after a reasonable period of operation) the system's capacity will be reduced to 350 bbl. per day per well or 30 per cent.

Capacity and line size calculations may be conveniently set up as shown in Table 1. These data are coordinated with the plan and profile information, Fig. 4. Line sizes and capacities are determined from the nomograph, Fig. 5.

Conclusions

1. Proper disposal of oil-field brines is a definite conservation measure and requires cooperation among oil operators.

2. Accurate estimates of maximum water production and careful design are essential to the economical and satisfactory operation of a disposal system.

3. Standard design factors and practices should be established by engineers.

4. Disposal-well reconditioning work can be minimized by a thorough knowledge of good operating procedures.

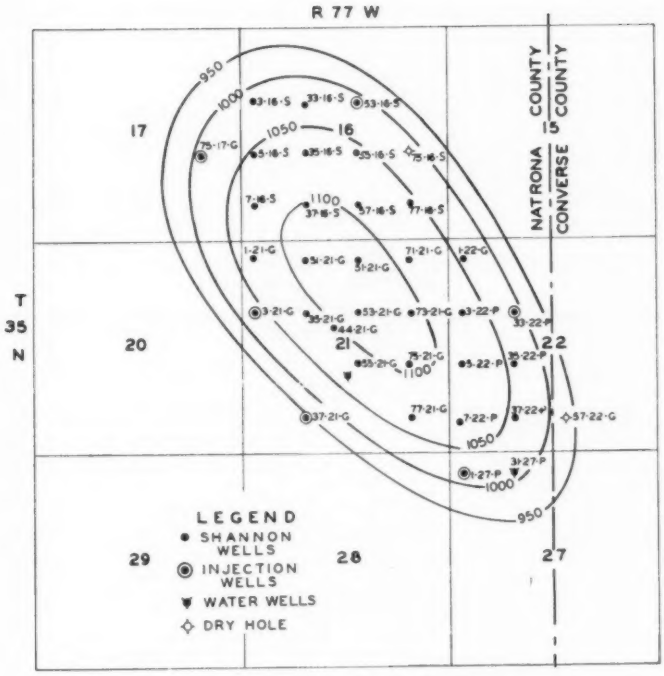

Fig. 1—Structure contour map top of Shannon sand.

Sound Engineering Practices Increase Recovery Efficiency

in Cole Creek's Shannon sand reservoir

by E. J. Whitaker* and D. T. Hoenshell*

THIS paper presents the initial results of pressure maintenance by water injection and controlled producing pressures in the Shannon sand reservoir, Cole Creek field, Wyoming. This field is located 20 miles northeast of Casper and in the southwestern portion of the Powder River basin. Shannon pool was opened in 1940, and drilling continued through 1945. A total of 1,620 acres with a net pay of 17½ ft. were found productive, with initial reservoir pressure of 1,650 psi.

Producing pressures at the pump are maintained by a "bubble point" extension jacket, and have remained at a near-bubble-point minimum. Water injection was started in 1946, and increased in 1950. Total injected water was 388,000 bbl. to January 1950 and 670,000 bbl. to February 1951.

It is believed that the conservation methods in use have effected an increased recovery efficiency and permitted higher producing rates, and will ultimately result in a substantial amount of otherwise nonrecoverable oil.

*General Petroleum Corp., Casper, Wyo. Presented at A.P.I. Division of Production meeting, Casper, Wyo.

Discovery and Development

The Cole Creek structure was first indicated by torsion balance and seismic surveys during 1936. The first well, No. 55-21-G, was spudded in September 1937. However, this well was carried to the Dakota-Lakota zone and placed on production in May 1938. Well 1-21-G was the first to be completed as a Shannon producer, in April 1940, with an initial production of 430 bbl. daily pumping. Drilling the Shannon continued through 1945. Two wells originally completed as Dakota-Lakota producers have been recompleted in the Shannon. At the present there are 25 wells producing, 1 idle, 2 abandoned, 6 in use for water injection, and 1 abandoned in the Shannon and later recompleted in the Parkman sand as a water well. Contour of the top of the Shannon sand is shown in Fig. 1.

Geological Data

The Shannon reservoir is a low-relief, elliptical structure with net oil-sand thickness averaging 17½ ft. The producing zone has been encountered as high as 1,120 ft. above sea level, and the original water table has been established as 980 ft. above sea level.

The producing sand is Upper Cretaceous, and can be described as fine to medium grained, glauconitic, with thin shale partings and inclusions. Analysis of 231 core samples indicates an average porosity of 19 per cent, interstitial water content 31 per cent, and permeability to air of 56 md.

Engineering Data

Cole Creek field is unitized, and General Petroleum Corp. is the sole operator. Thus, operating practices may be adapted to provide optimum rates, maximum ultimate recovery, and minimum reservoir waste, on the basis of sound engineering principles.

The well-spacing plan for development was based on one well per 40 acres, but, after the water table was defined, edge locations were left undrilled. A total of 32 wells were productive from the Shannon, giving an over-all average of one well per 50 acres.

Completion practices generally was to set 5½-in. casing above the sand and to drill through with a 4¾-in. bit.

The first Shannon reservoir pressure measured was 1,640 psi. at the 1,075-ft. above set level datum, in well 55-21-G during August 1940. The original reservoir datum pressure has been assumed as 1,650 psi.

An analysis of pressure-volume-temperature behavior of Shannon oil and gas was made by the General Petroleum Corp. production laboratories using recombined surface samples. Characteristics are shown in Figs. 2 and 3. Briefly, the analysis indicated a bubble point of 750 psi. at the reservoir temperature of 123° F. The total gas-oil ratio was 117 standard cubic feet per barrel with an A.P.I. gravity of 36.3°. Oil viscosity was 3.5 cp. at original reservoir conditions and 5.5 cp. at atmospheric pressure and reservoir temperature. Reservoir data are shown in Table 1.

Pressure-Production History

Fig. 4 shows a plot of pressure and production data of the Shannon reservoir. It is at once apparent that there is a close relationship between pressure and rates of withdrawal. By the

TABLE 1—RESERVOIR DATA—SHANNON SAND—COLE CREEK FIELD

Number of wells cored	19
Approximate mean depth, ft.	4,575
Oil-water ratio	0.29
Net sand thickness, ft.	17½
Porosity, per cent	19
Permeability to air, md.	56
Interstitial water, per cent of pore space	31
Productive area, acres	1,620
Estimated tank oil originally in place, M.M. bbl.	26.75
Original pressure at 1,075 ft. A.S.L., psi.	1,650
Reservoir temperature, °F.	123
Characteristics of produced oil:	
Total gas in solution, cu. ft. per bbl.	117
Oil gravity, °A.P.I.	36.3

latter part of 1943 it was decided to curtail production in order to arrest the rapid rate of pressure decline.

In 1944, pressure surveys indicated that natural water encroachment was sustaining a portion of the production. During 1945 the production rate was increased due to sales commitments, and the pressure again declined. Water injection was started with one well in February 1946, averaging 250 bbl. daily, and "bubble point" pumps were installed in 15 wells.

For the next 2½ years net formation withdrawals averaged some 550 bbl. daily, and pressure remained constant. In mid-1948 a decision to produce the field at maximum rates was made, and the pressure again declined. During this period the rate of production declined similarly to the pressure, as it had in 1943. However, it should be noted that the field was able to produce at rates comparable to those of 6 years earlier, even though the pressure was about 250 psi. lower.

In mid-1949, bubble-point pumps were installed in all producers not previously equipped, and all casing heads shut in. This effected a marked reduction in rate to about 750 bbl. daily average during the last quarter of 1949. In January 1950 water injection in well 53-16-S was started, and in March, July, and August four additional wells were added to the injection system. During 1950 the oil rate consistently increased, to about 960 bbl. daily average in January 1951, and the pressure also exhibited a similar increase.

Bubble-Point Pump

Mention has been made of the installation of bubble-point pumps in the Shannon wells. This pump is simply a standard RLT unit, with the addition of a 15-ft. extension between the bottom of the pump barrel and the standing valve. The pump is very sensitive to free gas, and will gas-lock when producing pressure drops below the bubble point and gas evolves from solution. This tends to maintain a back pressure on the formation near the bubble-point pressure, when, of course, the casing head is shut in and casing pressure is stabilized.

Observations indicate that producing pressures have remained within 150 psi. of the bubble-point pressure. As compared with other methods of maintaining a back pressure on a producing sand, the bubble-point pump, operated with casing head shut in, has proved very satisfactory.

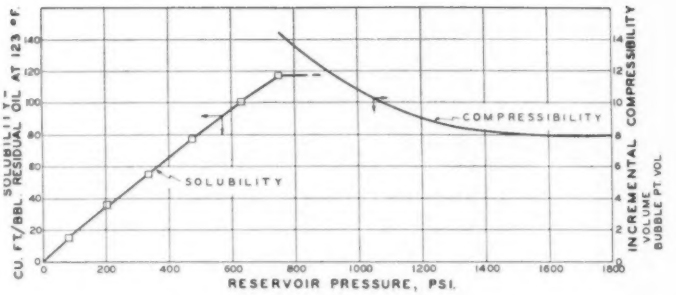

Fig. 2—Solubility by differential liberation at 123° F. and compressibility of bubble point mixture at 123° F.

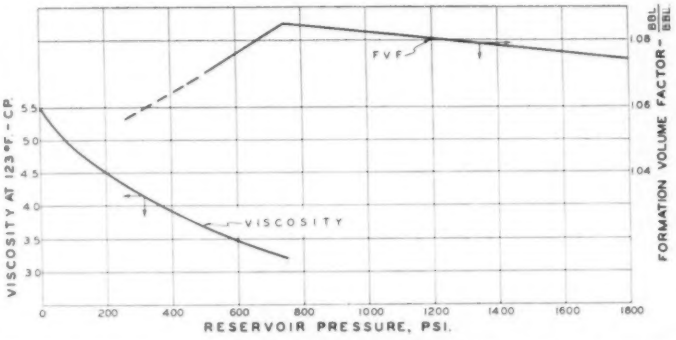

Fig. 3—Formation volume factors (bbl. of bubble-point liquid at 123° F. per bbl. of tank oil) and oil viscosity.

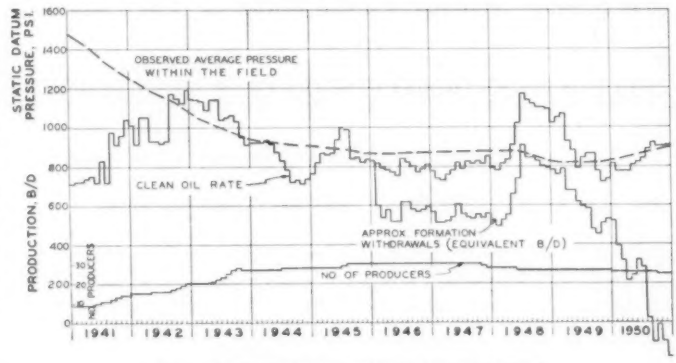

Fig. 4—Pressure-production history, Shannon reservoir.

Water Injection

As it became evident in 1943 that natural water encroachment would not support pressure and oil rate at the desired levels, engineering thought was given to a water-injection project. Water flow tests were made on cores, and injection experiments were made on several wells in the field.

Well 37-21-G was finally selected and initial injection was started in February 1946. This is a closed system involving a water well, purification and treating plant, and injection well, all housed together with a tail pump on the water well unit providing injection power. Water was injected at a rate of 200-300 bbl. daily against pressures up to 350 psi. This unit is still in operation, and has

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STATEMENT OF THE CONDITION

June 30, 1951

RESOURCES

Cash and Due from Banks	$60,783,200.58	
U. S. Government Securities	67,466,042.98	
Other Bonds and Warrants	13,727,850.38	$141,977,093.94
Loans and Discounts		45,625,375.44
Overdrafts		42,546.68
Income Receivable Accrued		465,332.62
Prepaid Expenses		115,919.46
Stock in Federal Reserve Bank		180,000.00
Bank Premises		2,000,000.00
Customers' Liability Under Acceptances		67,980.00
Customers' Liability Under Letters of Credit		2,912,941.13
Total		$193,387,189.27

LIABILITIES

Deposits		$177,390,110.19
Acceptances Executed		67,980.00
Letters of Credit Outstanding		2,912,941.13
Income Collected, Not Earned		184,118.99
Reserve for Taxes, Interest, etc.		1,041,305.39
Dividends Declared*		150,000.00
Capital — Common	$3,000,000.00	
Surplus	3,000,000.00	
Undivided Profits and Reserves	5,640,733.57	11,640,733.57
Total		$193,387,189.27

*Payable $75,000.00 July 13, 1951, and $75,000.00 October 15, 1951

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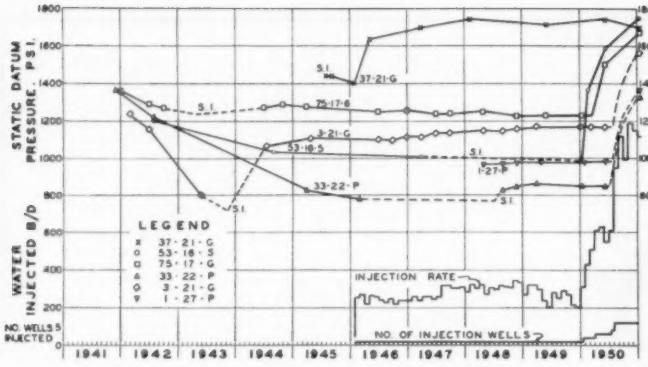

Fig. 5—Water injection history, Shannon reservoir.

injected 462,000 bbl. of water in the 5 years to February 1951. It is believed to be the first water injection project in the Rocky Mountain area.

In January 1950, well 53-16-S was placed on injection, as the first of several on a closed system. In March, well 75-17-G was added, and in July and August three more were added to the system. Water is obtained from a water well producing about 800 bbl. daily from the Parkman sand and another producing about 300 bbl. daily from a shallower sand. Produced water at each well is surged in a gas-capped pressure vessel and injected via a common system by slush pumps. Regulation of rate per well is controlled at the well heads. All of the five wells have not filled with water to date, and individual well-head pressures vary from zero to 90 psi.

History of the six injection wells, five of which were formerly producers, is shown in Fig. 5. Injectivity indexes of these wells range up to 1.0 bbl. per pound per square inch pressure increase, and are individually up to 30 times the highest recorded productivity index. Total injection rate has averaged 1,100 bbl. daily since August 1950.

Inferred Results

Examination of the pressure-production behavior of the Shannon reservoir shows something of the effect of water injection and controlled withdrawal. Initial control of withdrawals in 1944 arrested the rapid pressure decline, but the 900 bbl. daily average rate was appreciably higher than the natural water encroachment rate. After the start of water injection in 1946 and the total amount of water entering the reservoir was sufficient to sustain an oil rate of 800 bbl. daily without pressure decline. It is estimated that during this period the natural water drive was about 700 equivalent barrels daily, and the injected water about 50 per cent effective.

After the attempt to produce the sand at a 1,200 bbl. daily rate in 1948, and the later control of producing rates by installation of bubble-point pumps, field average pressure was about 810 psi. and net oil rate averaged 750 bbl. daily during the last quarter of 1949. Estimated natural water encroachment was about the same as before, and augmented by some 250 bbl. daily of injected water, still about 50 per cent effective. (The increased rates of 1948 were almost entirely supported by solution-gas drive.) The lower static pressure at the end of 1949, with bubble-point control, was effecting an automatic withdrawal rate control beneficial to reservoir pressures.

With the augmented injection in 1950, the increase in static pressure has resulted in an oil rate about 200 bbl. daily higher than at the beginning of the year. At present both the static pressure and the production are increasing.

Calculations indicate that to the present, some 400,000 bbl. of oil has been recovered by these conservation methods, which would not have been recovered by pressure depletion alone. The apparent recovery efficiency in the area swept by water to the middle of 1950 was in the order of 36 per cent. With the present distribution of injection wells, it is believed that the augmented water sweep will be more effective than the natural water drive, due to pressure maintenance within the pool which will prevent separation of solution gas in the sand pore space, and will also tend to prevent the rapid bypassing of tight lenses or strata. Thus, it is estimated that the ultimate recovery efficiency will be greater than 36 per cent, and a 4 per cent increase would mean some 1,000,000 bbl., otherwise nonrecoverable.

Conclusion

It is still too early in the life of the injection project to appreciate quantitatively the full results of the endeavor. However, it is believed that the conservation of reservoir pressure and energy has effected an increased recovery efficiency and permitted higher producing rates, and will ultimately result in a substantial amount of otherwise nonrecoverable oil.

The project is another step in the practical application of sound engineering principles in the control of reservoir performance for the purpose of increasing ultimate recovery, prevention of the waste of reservoir energy, and conservation of natural resources.

Aluminum's Role in Refinery Equipment

(Continued from page 87)

contact with asbestos cements. For that reason the company has discontinued using aluminum, and it is using galvanized sheets. This was its original specification, and it only used aluminum as a substitute during the war period when galvanized material was impossible to obtain.

Hafsten[11] has indicated that aluminum has been used in place of sheet steel for insulated tanks and lines, and has been generally satisfactory. One failure was reported when aluminum was applied over magnesia insulation on a pipe line.

Piping

Northup[9] has reported a test installation of 5 miles of 4-in. and 6-in. aluminum pipe of all-welded construction (Heliarc process), except where joined to existing steel pipe. At these points aluminum flanges are used. The materials' specifications are as follows:

4-in.—63S-T6—0.220-in. to 0.247-in. wall pipe.
6-in.—63S-T6—0.253-in. to 0.280-in. wall pipe.
4-in.—63S-T6—series 60 flanges
6-in.—61S-T6—series 60 flanges.
24S—anodized flange bolts.
43S—welding wire.

Flanges were installed with bakelite sleeves, gaskets, and washers. The line was exposed to the following corrosive agents:

1. Iron sulfide and scale from corroding steel pipe in the same system.
2. Approximately 7 cu. ft. of hydrogen sulfide per 100 bbl. of oil.
3. Brine.
4. External marshy soil conditions.

This pipe was installed early in 1948. In the fall of 1949 an inspection indicated that external corrosion had occurred on one section of 4-in. pipe in a marshy area of southern Arkansas. An analysis indicated that this corrosion had resulted from poultice action of adherent heavy clay, chlorides, and heavy metals in acidic water. Pitting had occurred to a maximum depth of 1/32 in.

Internal pits were also in evidence, and the internal corrosion rate was estimated to be about ⅛ in. per year. At this rate leaks were predicted for 1950.

The aluminum pipe did fail in April

1950, after 26 months' service. The first leak was caused by internal pitting in the 4-in. section of pipe. The pit which caused failure, as well as all of the deepest pits found, was located in a 1-in.-wide band on each side of the weld. This band probably was annealed by the heat of welding. The majority of pits were on the bottom third of the pipe. The failure resulted in a complete inspection of the line, and all the aluminum pipe was found to be corroded internally.

The replacement material has not been selected, but a test of other aluminum alloys is to be initiated. It is expected that this test will consist of 10-ft. sections of four different aluminum alloys which will be installed at various corrosive locations.

Steel pipe has been, and still is, used for this service. The steel is subject to severe corrosion from sour crude, and in a few years is beyond economic use. The steel also is corroded from brine, scale, and hydrogen sulfide which are allowed to settle during slack periods. The bottom one-third of the pipe is affected most.

Pump and Turbine Packing

Northup[9] has reported two cases of packing for blowers and turbines. The first was a labyrinth-type packing and interstage seal rings used on a steam turbine. The steam was superheated, and it entered at a pressure of 650 psi. at 700° F. The aluminum, a casting, had the following nominal composition, as given by the manufacturer:

Element—	Per cent
Tin	7.0 to 9.0
Copper	4.5 to 5.0
Nickel	0.8 to 1.2
Manganese	0.4 to 0.6
Silicon	0.3
Iron	0.5
Aluminum	remainder

The aluminum parts failed after about 3 months' operation. Failure was attributed to high-temperature steam (600° F.) at the first stage. The steam apparently reacted directly with the aluminum to form aluminum oxide and hydrogen. The attack was probably initiated by hot deaerated condensate and/or alkaline carry-over from the boilers. These were of sufficient intensity (pH, 10.0) to corrode the protective oxide film normally present on the metal surface. There was no evidence of defective materials, and no galvanic corrosion is reported—although the aluminum was in contact with cast-iron and cast-steel case parts and a forged-steel shaft.

Bronze replacement parts were used, and these have been satisfactory after 1 year's service—although no inspection has been made.

The second case is a centrifugal blower which takes air at —30 to +100° F., and discharges at a pressure of 15 to 30 psi. at a temperature from 250° to 300° F. No filters are used. Again aluminum was used as a labyrinth packing and as interstage seal rings. The aluminum composition is the same as that previously given for the turbine.

This blower has been in service for 8 to 9 years, and no corrosion has been experienced, even though the aluminum is in contact with the cast-iron casing and alloy-steel shaft. The aluminum parts are expected to last about 20 years without replacement.

In both cases aluminum was selected in order to obtain the following properties:

1. A soft material which would not score the shaft.
2. An easily machined material so as to obtain the necessary close tolerances.
3. An easily cast material to reduce cost.
4. A corrosion-resistant material so as to prevent bypassing.

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CORROSION and its control

Ground Beds

THE current which is drained from a pipe line or other structure by a cathodic-protection unit must be discharged to earth in order to complete the circuit. The assemblage of terminals through which this discharge takes place is known as the "ground bed." Three important factors enter into its design: resistance, permanence, and cost. Low resistance is of obvious importance; if the total resistance of a circuit is 0.4 ohm and a current of 40 amp. is to be drained, then a 16-volt rectifier will be required; the total output power will be 640 watts, corresponding to about 1,280 watts input. Now if the current resistance could be reduced to 0.2 ohm, the same current could be drained with an 8-volt rectifier, and the power consumption will be cut in half. The question to be decided is, of course, whether the power saving will justify the increased investment required for the more extensive ground bed. Doubling the size of the ground bed will not in general halve its resistance; and halving its resistance will not halve the whole circuit resistance, since much of it lies elsewhere. Consequently a point is soon reached—in any particular soil—where further reduction in ground bed resistance costs more than it saves.

The major factor in the resistance of a ground bed is the resistivity of the soil in which it is installed. Low-resistivity soil is often the primary factor in the location of a cathodic protection unit, even when accessibility, ease of construction, and availability of power must be sacrificed.

Permanance, as applied to ground beds, is a relative term. In former years, when scrap iron and steel were much less expensive than now, these perishable materials were much used for the purpose. The discharge to earth of 1 amp. of current will consume about 20 lb. of steel annually; the effective consumption of cast iron is somewhat less, because the graphitic residue is also effective as an anode to some extent. Although the present prices of scrap are too high to justify its use as anodes, there is an occasional opportunity to use some abandoned structure in place for the purpose; the cost of removal subtracted from the junk value may bring it within reach, particularly since the cost of installation can also be saved.

More permanent ground beds can be constructed with carbon or graphite anodes. If properly installed in a thoroughly tamped backfill of coke breeze, and if operated at a sufficiently low current density, these anodes will last almost indefinitely. As with any type of ground bed, the major controlling factor in the resistance is the resistivity of the soil. The size, depth, spacing, and total number of anodes also enter into the solution. The next installment in this series will present some of the formulas involved in the calculations; the present concern is with the details of construction.

Construction Details

Good installation starts with the setting of the anodes. They are available in 2, 3, 4, and 6-in. diameters, all in the standard 80-in. length; they are normally equipped with a 30-in. No. 4 copper lead, rubber insulated and neoprene sheathed. The hole may be from 4 to 12-in. larger than the anode; the larger holes will yield a lower resistance, and may be specified, according to the design. The backfill should extend for at least a foot above and below the anode. It must be added gradually and tamped very firmly around and above the anode; care must be taken not to damage the anode, the cable lead, or the waterproof seal where the lead is attached to the anode. The last part of the hole, above the backfill, should be filled with gravel or crushed stone.

Every joint in the cable system should be made with as low a resistance as can be obtained. The use of mechanical joints is discouraged; where bolted joints are used, the lugs should be filed smooth and flat and made up very tightly. The preferred method is soldering; a joint may be wrapped and poured, or some other approved method of soldering employed. If the cables in the anode system are to be buried—and this will usually be the case—it is very important that these joints be thoroughly and carefully wrapped. If the slightest bit of soil moisture can reach the cable, the passage of current to ground from the cable will result in the rapid corrosion of the copper, and the cable will be severed.

The depth to which the cable is buried must be determined by the hazards to which it may be exposed; it is obvious that accidental severance of this cable will result in an interruption of protection. If explosive vapors are likely to be present, the accidental breaking of a cable will result in an arc of several amperes, with a very real possibility of serious accident. To forestall such possibilities, some engineers have specified that a layer of colored concrete be poured over the cable before burial; creosoted timbers have been used for the same purpose.

Where the installation is within the property of the company, or some other location properly protected, the anode cables may be installed above ground. This will result in a considerable saving, since bare wire may be used, instead of the expensive insulation required for buried cable. Such installations are not recommended for isolated locations, however—large-size copper cable is extremely attractive scrap metal and quite likely to be stolen.

On the cathode side of the rectifier these extreme precautions are not required. The only disadvantages of poorly insulated cable here are the additional power required, or the possible loss of protection. Long runs of totally bare cable are not recommended, but less-expensive insulation is serviceable, and in many cases secondhand cable is entirely satisfactory, with a very real saving in total cost.

Part 20 of a series by Marshall E. Parker, consulting engineer, Houston.

An investigation of

TORQUE-CONVERTER DRIVES

. . on mud pump ——— by David F. Toomey* and Ernest G. Chilton†

Torque converters were long considered unadaptable to slush pumps. However, a better understanding of converter application and mechanical improvements in the power slush pump have eliminated earlier objections.

FOR many years the direct-acting steam-driven slush pump was the most popular type for use in the oil fields. However, as improvements were made in the construction of the power slush pump and a better understanding of its operation was developed, it became competitive economically as well as operationally to the steam pump. Unfortunately, operators failed to recognize that the power pump was an almost entirely different piece of equipment which brought with it completely altered fluid-flow characteristics. Until these differences have been recognized and fully understood, the operator cannot expect to replace the direct-acting steam pump with a power pump and obtain completely satisfactory performance.

The fluid ends of both types of pumps are alike, generally being reciprocating, double-acting. However, in type of drive the pumps differ completely. The driving mechanism for the direct-acting steam pump generally consists of a conventional slide-valve engine in which the steam piston is directly connected to the fluid piston by the piston rod. In contrast to this the power pump, by universal usage of the term, has come to mean one which is powered by an external prime mover. The two pumps with their radically different types of drives have correspondingly very different characteristic flow curves.

Fig. 1 shows the flow characteristics

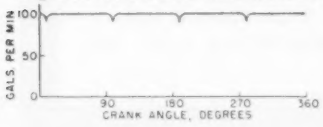

Fig. 1—Double-acting duplex steam-driven pump flow characteristics.

of a direct-acting duplex steam pump. Theoretically, a direct-acting steam pump maintains steady flow and a constant pressure, and because it is not greatly affected by the influences of the inertia of moving parts, the actual flow curve conforms closely to the theoretical curve.

In contrast, the power pump has certain flow and acceleration characteristics which are modified by the details of design, and which are not changed by the pumping system. Whereas the direct-acting pump adapts itself to a considerable extent to the characteristics of the pumping system, a power pump has no such flexibility and labors to make the flow in the entire system correspond to its particular flow pattern.

Fig. 2 shows a typical flow curve for

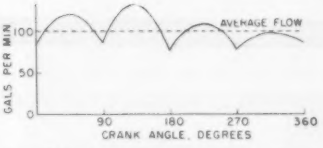

Fig. 2—Flow characteristics for double-acting duplex power pump.

a duplex double-acting power pump. Flow pattern resembles a sine plus cosine curve, but is distorted due to the effect of angularity of the moderate-length connecting rod and the volume of fluid displaced by the piston rods. The amount of this distortion depends upon the ratio of the length of connecting rod to the length of crank, and the difference between head-end and crank-end piston areas resulting from the piston-rod consideration. This distortion effect causes the periodic variations in the combined flow curve, which has the four peaks: medium, high, medium, and low.

In analyzing the pressure fluctuations inherent in the power pump it is usually found that the rate of change rather than the amount of change of fluid flow is responsible for the pulsations. Since the maximum rate of change of fluid flow is proportional to the product of the pump speed and the greatest slope of the combined flow curve, variations of either will affect the pressure pulsations accordingly. This is accomplished in the triplex pump by smoothing out and reducing the maximum slope of the combined flow curve with an additional cylinder.

Now comes an important concept which is seldom recognized by the operators of power slush pumps. For two pumps having different size liners and operating at the same output, the one with the smaller-size liner and higher speed will have considerably increased pressure pulsations. It has the same total flow variations as the slower pump with the larger liners, but with the difference that it takes place more frequently. Thus the rate of change of fluid flow is greater for the smaller higher-speed pump and consequently the fluctuations in pressure will be greater.

Direct-Acting Steam Pump Pattern

Power pumps as they are operated today usually follow much the same pattern of application as the direct-acting steam pumps. As the well depth increases with a corresponding increase in pressure, each pump is forced to slow down until at some depth the liner must be changed to a smaller size or the pump will stall. With each change in liner size the pump again speeds up, and, in the case of the power pump, each increase in speed is accompanied by a corresponding increase in magnitude of pressure pulsations.

The application of mechanical transmissions to power slush pumps has offered the advantage of operating at slower speeds while retaining the same size liner without stalling the pump. Another more recent development has been the application of hydraulic torque converters, which, for many years, were considered unadaptable to slush pumps. However, a better understanding of converter application and mechanical improvements in the power slush pump have eliminated many of the earlier objections.

The converter on a slush pump offers several valuable features, probably the most familiar one being that it permits the engine to operate at its most efficient speed while the pump automatically adjusts itself to maxi-

*Shell Oil Co., Long Beach, and †Shell Development Co., Emeryville, Calif. Portion of paper presented at A.P.I. Division of Production meeting, Los Angeles, May 1951.

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mum discharge volume, thus obtaining relatively constant hydraulic horsepower at its discharge.

Recently, a test was conducted to determine if a torque-converter drive would reduce power pump pressure pulsations by a comparison with a conventionally driven pump equipped with a necessarily smaller-size liner. The test was conducted at a rig drilling 6¼-in. hole with 3½-in. o.d. internal-flush drill tubing at a depth of 6,063 ft. Seven-inch, 26-lb. per foot casing had been set at a depth of 5,725 ft.

The No. 1 pump, which had a 7¼-in. liner and 16-in. stroke, was rated at 300 hydraulic horsepower, and was driven through a single-stage torque converter and chain drive by a 12-cylinder twin diesel engine rated at 290 combined brake horsepower.

The No. 2 pump, which had a 6-in. liner and 14-in. stroke, was rated at 280 hydraulic horsepower, and was driven through a clutch power take-off and V-belts by two six-cylinder gas engines rated at 180 b.hp. each.

Unfortunately, the two pumps were not alike either in length of stroke or prime mover. However, in a practical sense the conditions of the test were quite representative of an actual drilling situation. The necessity of using 6-in. liners in the No. 2 pump was probably indicative of the size liner that would have been required by the No. 1 pump had it been conventionally driven at that depth. This situation is illustrated in Fig. 3, which

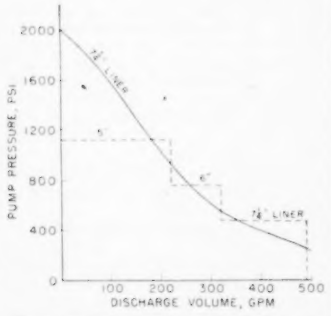

Fig. 3—Performance curve for 7¼ by 12-in. power slush pump with torque-converter drive and one size liner, compared to same pump with conventional drive and various size liners.

compares the performance curve of a converter-driven pump with a single size liner to that of the same pump conventionally driven with several size liners.

Each of the two pumps was tested individually by replacing the mechanical pressure gage with a Statham pressure pickup and operating the pumps at pressures ranging from 300 to 1,100 psi., inclusive. The drilling fluid consisted of 74-lb. per cubic foot water-base emulsion mud, which was

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circulated with the bit rotating off bottom. Results of the test are shown in Fig. 4 in which the maximum and

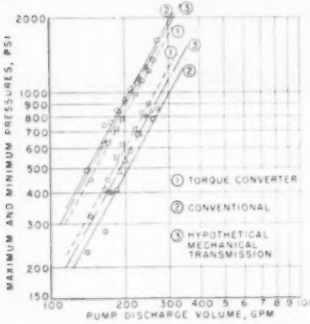


Fig. 4—Maximum and minimum curves for slush pump using conventional drive and for one using torque converter and a hypothetical mechanical transmission.

minimum pressures recorded for one crank revolution are plotted for both pumps against calculated actual discharge volumes.

From Fig. 4 it is apparent that the pressure pulsations of the converter-driven pump were considerably reduced, because both the maximum and minimum pressures for this pump, represented by the lines marked (1), fall within corresponding pressures for the conventionally driven pump, represented by the lines marked (2). The amount of this reduction, represented by the vertical distance between the variation lines marked (1) and (2) in Fig. 5, is approximately

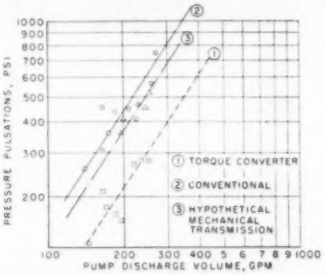


Fig. 5—Curves showing pressure pulsations for a slush pump using conventional drive, a converter, and hypothetical transmission.

50 per cent. However, had the No. 2 pump been operating with a 16-in. instead of a 14-in. stroke, the slower speed probably would have reduced this figure somewhat. Nevertheless, the reduction of pressure pulsations was appreciable and led to an attempt to predict what the reduction in variation would have been if the No. 1 pump had been equipped with a mechanical transmission.

In this connection, a theoretical analysis was developed by means of which maximum and minimum pressures, represented by the lines marked (3) in Fig. 4, were calculated for the No. 1 pump assuming it was equipped with a mechanical transmission instead of a converter. As anticipated, these curves fell inside those for the conventional drive, and, more importantly, outside the curves for the converter drive. Fig. 5 shows that the pressure variations of the conventionally driven pump could have been reduced by 16 per cent with the application of a mechanical transmission, as opposed to the previously demonstrated 50 per cent reduction obtained by the converter drive.

The reduction of pressure pulsations corresponds to the general alteration of the pressure curve when a converter drive is applied to a slush pump. The pump is no longer required to conform without variation to the constant-speed characteristics of the prime mover, but may, with the elimination of the positive mechanical drive, develop relatively independent operating characteristics of its own. What happens is that the individual operational cycle of the crank is changed from a constant to a varying angular velocity. This is illustrated to good advantage in Fig. 6 in which

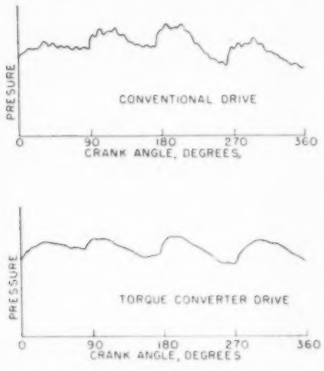
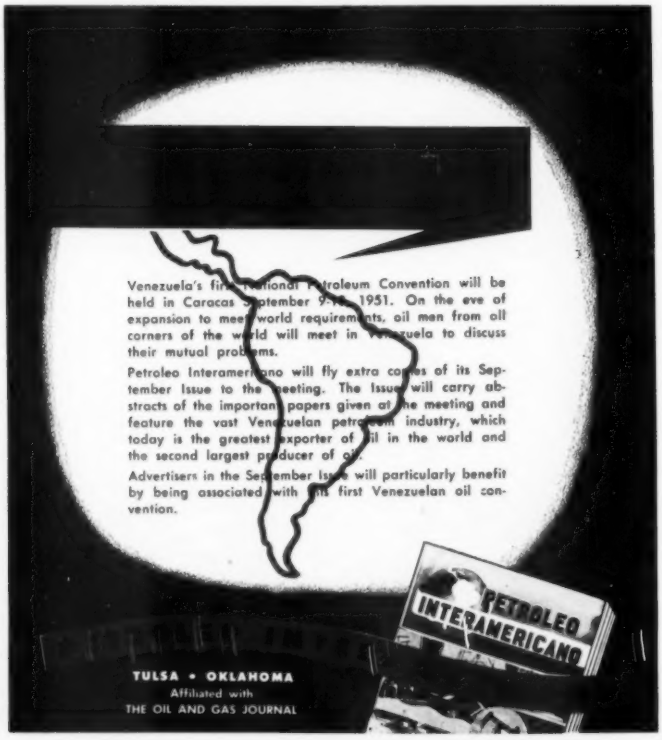


Fig. 6—Comparison of measured pressure traces of two power slush pumps, one using conventional drive and the other a torque converter.

it is evident by comparison of the manner in which the pressure curve of the converter-driven pump is altered. Maximum pressures are lowered and minimum pressures are raised, while duration of comparable parts of cycle is not constant.

In general, the pressure curve for the conventionally driven pump is characterized by peaked maximum pressures and a sharply fluctuated rise and fall of pressures between peaks, while that for the converter-driven pump is a much smoother curve characterized instead by rounded maxi-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mum pressures and a gentle rise and fall of pressures between them.

Conclusions

A direct-acting steam pump adapts itself to the characteristics of the pumping system, whereas a conventionally driven power pump has no such flexibility and labors to make the flow in the entire pumping system correspond to its particular flow pattern. However, with a torque-converter drive, a slush pump acquires a new degree of flexibility and by the elimination of the positive mechanical drive it is no longer required to conform rigidly to the constant-speed characteristics of the prime mover. Instead, new and relatively independent characteristics are developed resulting in an entirely altered pressure curve.

In a power pump pressure pulsations are a function of the rate of change of fluid flow, which, in turn, is proportional to pump speed.

A torque converter was found to reduce pressure pulsations by approximately 50 per cent when compared to a conventionally driven pump, which, for the particular situation considered, was operating at higher speeds as a result of the necessary reduction in liner size. A theoretical analysis, in which it was assumed that the converter was replaced by a mechanical transmission, showed that the pressure pulsations of the conventionally driven pump would have been reduced by 16 per cent.

The reduction of pressure pulsations will permit raising the rated pressures of the fluid end of the pump. For a particular situation it was demonstrated that the rated pressure of a conventionally driven pump could be increased approximately 25 per cent by the application of a torque converter, and by approximately 10 per cent by the application of a mechanical transmission.

Comment by Gene Graham, Rocky Mountain Drilling Co., Los Angeles:

1. **The importance of pumping equipment.** — As a member of drilling-contracting company I am well aware of the tremendous effect on drilling efficiency to be obtained from proper application of power to pumps.

2. **Cost reduction.**—The reduction of all elements of drilling costs is a problem of vital importance to all of us—contractors and operators alike. While this paper does not deal directly with costs, the implication exists that costs, generally, will be reduced by torque converter application.

3. **Care of equipment.**—With the tightening labor market, due to increased industrial activity in all branches of business, means must be found to minimize the need for the close attention drilling equipment now requires. If torque converters will permit more economical operation of the prime movers as well as the pumps, they are worth the investment.

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Correction Factors for Balancing Effect of a Gas in One Leg of a Manometer

by Howard S. Bean* and Francis C. Morey†

THE increase in the distribution and value of natural gas, together with the higher line pressures at which such gases are metered with orifice meters, has induced measurement engineers to analyze carefully all factors affecting the accuracy of their gas measurements. One of these factors is the balancing effect of the column of gas in the high-pressure side of a manometer.

This paper presents a mathematical analysis of the factor, showing that it is directly dependent upon the ratio of the density of the gas to the density of the manometer liquid. A table is given showing the magnitude of the factor for typical operating conditions. This is followed by a discussion of the application of the factor to the simple equal-area U-type manometer, and to the industrial type of recording differential-pressure gage, reading in inches of water, and having a manometer of unequal areas with a mercury and float-actuating element.

One of the factors affecting the accuracy of gas measurements with orifice meters is the balancing effect of the column of gas in the high-pressure side (or low-liquid side) of a manometer. (This is sometimes incorrectly referred to as "the unbalanced gas column.") The following notes have been prepared to show how the effect of this gas column may be taken into account:

Referring to Fig. 1, we will use the following notation:

- h = the observed differential pressure, or "manometer reading"
- ρ_L = density of the manometer liquid
- ρ_G = density of the gas at pressure p_1 in the high-pressure leg
- p_1, p_2 = absolute pressures on the high and low-pressure legs, respectively

We will assume that the temperatures of the pressure lines and manometer are equal, and that $p_1 - p_2$ is small compared with either p_1 or p_2, so that at the plane A-B the weights of the fluid (gas) in the pressure connections above that plane may be considered equal.

Then at the plane C-D, we have:

$$p_1 + h\rho_G = p_2 + h\rho_L \quad (1)$$

or

$$p_1 - p_2 = h\rho_L - h\rho_G$$

$$= h\rho_L (1 - \rho_G/\rho_L) \quad (2)$$

Thus, we see that the term $(1 - \rho_G/\rho_L)$ is a correction factor to the manometer "reading" to give the true pressure difference in terms of a column of the manometer liquid.

This correction may be, and usually is, neglected in ordinary work, especially at low pressures. However, when high precision is required or when the over-all pressure (i.e., both p_1 and p_2) is sufficiently high it becomes significant and should be taken into account, as will be illustrated later. Also, the correction should be taken into account when a liquid flow (e.g., water) is being metered and the differential pressure is measured with an inverted U-manometer to the top of which compressed air is admitted to bring the water surfaces in the manometer legs to a convenient reading position.

The conditions stated above as a basis for Equation 1 will be fulfilled

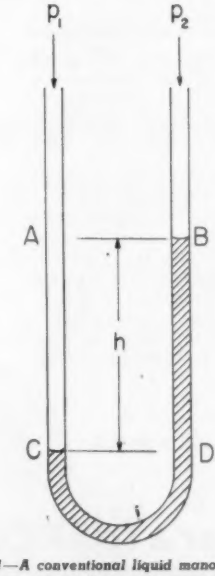

Fig. 1—A conventional liquid manometer for measuring the difference between two pressures.

in most actual installations, especially if the difference in elevations of the differential pressure source and manometer is small, and if the temperatures of the pressure connections are sensibly equal. However, there may be installations where there is not only a considerable difference in the elevations, but also an appreciable difference in the densities of the gas in the two pressure connections due to large differences in the pressures and temperatures. To extend Equation 2 to include the effects of such a condition, let:

- Z = difference in elevation between the differential pressure source and manometer. The sign of Z will be positive (+) when the differential source is higher than the manometer, and negative (—) when lower than the manometer
- ρ_G = density of gas in the high-pressure connection, corresponding to its pressure p_1 and average temperature, T_1
- ρ_g = corresponding density in low-pressure connection at p_2, T_2

Then at section C-D, Fig. 1:

$$p_1 + h\rho_G + Z\rho_G = p_2 + h\rho_L + Z\rho_g \quad (3)$$

and

$$p_1 - p_2 = h(\rho_L - \rho_G) - Z(\rho_G - \rho_g)$$

$$= h\rho_L (1 - \rho_G/\rho_L) - Z\rho_G (1 - \rho_g/\rho_G) \quad (4)$$

In Equation 4, the factor $(1 - \rho_g/\rho_G)$ measures the effect of any difference in the densities of the gas in the pressure connections, and as Z increases the magnitude of the full correction term increases.

In developing the above equations, nothing has been said about the units in which the various quantities are expressed. Of course, in the factors $(1 - \rho_G/\rho_L)$ and $(1 - \rho_g/\rho_G)$ it is sufficient if the densities be expressed in the same units. However, in the use of Equations 2 and 4, in which these appear, it will be necessary to take account of the units in which the several quantities are expressed. In engineering work, it is customary to measure pressures p_1 and p_2 in pounds per square inch, h in inches, Z in feet, and densities (or specific weights) are expressed in pounds per cubic foot. Applying these units to Equations 2 and 4 gives:

*Physicist, chief, and †physicist, assistant chief, Capacity, Density and Fluid Meters Section, National Bureau of Standards.

$$p_1 - p_2 = \frac{h\rho_L}{1{,}728}(1 - \rho_a/\rho_L) \quad (5)$$

and

$$p_1 - p_2 = \frac{h\rho_L}{1{,}728}(1 - \rho_a/\rho_L)$$

$$- \frac{Z\rho_a}{144}(1 - \rho_a/\rho_a) \quad (6)$$

Table 1 has been prepared to show, for several conditions, the magnitude of the correction term as given by Equation 5. In preparing this table, the following values were used:

Density of water at 60° F., lb. per cu. ft.	62.367
Density of mercury at 60° F., lb. per cu. ft.	846.322
Density of air at 60° and 1 atm.	0.07637
Specific gravity of methane, air = 1	0.5549
Specific gravity of carbon dioxide, air = 1	1.529

As indicated by the definitions above, ρ_a and ρ_g are actual densities of the gas at the plane A-B, Fig. 1, in the high and low-pressure connections to the manometer. Hence, in computing their values the effects of "supercompressibility" (i.e., departures from Boyle's law) are to be taken into account. The supercompressibility factor for the gas in question should preferably be obtained from an actual determination, but may be obtained from such tables as are given in Bulletin TS 461 of the California Natural Gasoline Association. In this connection, it may be noted that at 60° F. the vapor pressure of carbon dioxide is 747.5 psia.,* and the value of the supercompressibility factor at 60° F. and 50 atm. was obtained by extrapolation from data given in Table 1 of Communications of the van der Wall's—Fund, No. 93. On the other hand, it was assumed that the density of the manometer liquid is unaffected by pressure over the pressure ranges here considered.

TABLE 1—VALUES OF THE MANOMETER FACTOR $(1 - \rho_a/\rho_L)$

p_1 atm.—	1	10	25	50	100
p_1 psia.—	14.70	147.0	367.5	735	1,470
Air-water	.999	.988	.969	.938	.876
Air-mercury	1.0	.999	.998	.995	.991
Methane-water	.999	.993	.982	.962	.918
Methane-mercury	1.0	.9995	.999	.997	.994
Carbon dioxide-water	.998	.930	.945	.84	
Carbon dioxide-mercury	1.0	.9985	.996	.99	

The range of specific gravities of gases encompassed between methane and carbon dioxide includes most all gases of interest in the fuel-gas industry, and with which manometers may be used under elevated pressures.

While the factors for a CO_2-water system are given for pressures up to the vapor pressure of CO_2, such a system would be of limited use because the solubility of CO_2 in water increases rapidly as the pressure is increased. The reason for including the CO_2-water factors is to illustrate the magnitude of the correction factor for gases having a specific gravity in the range of CO_2.

It was convenient, for showing the quantities used in developing the equations, to illustrate in Fig. 1 the conventional design of manometers, in which the two legs are of approximately equal areas. However, the analysis and equations apply to any design of manometer employing a liquid column to measure the difference between two pressures.

In the great majority of commercial gas-metering installations involving the measurement of a differential pressure, some form of recording gage is used. Most of these recording differential-pressure gages have a mercury manometer of unequal leg areas. In the larger leg, or pot, there is a float, which, through a system of linkages, operates a recording pen over a chart graduated in inches of water. Now the question arises as to what correction factor should be applied to the readings of such a gage?

First, consider only the manometer

*Table 8 of The Vapor Pressure of Liquid and Solid Carbon Dioxide, R.P. 538, NBS J. of Research, Vol. 10, No. 3, Mar. 1933.

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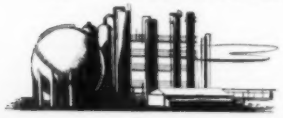

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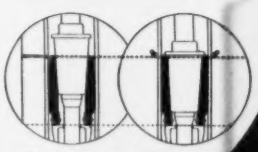

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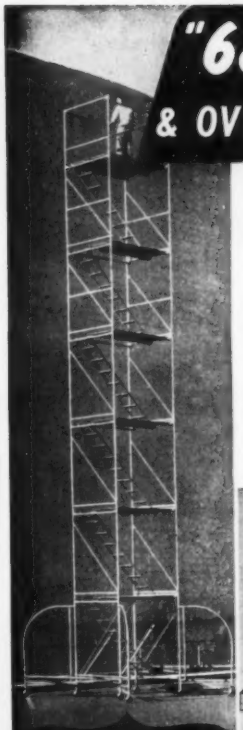

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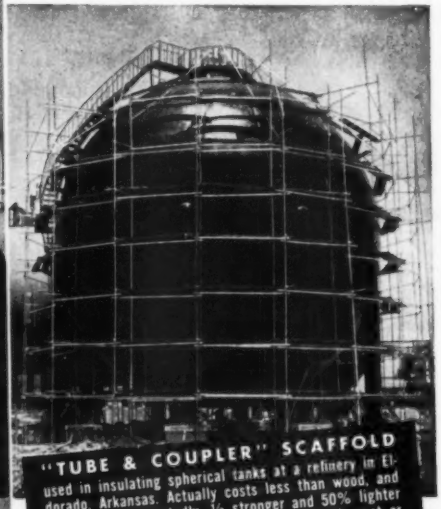

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element of this gage. Obviously, this falls in the gas-mercury group, with correction factors ranging down to about 0.99. If these correction factors are applied to the "observed" mercury column readings, we obtain the value of the differential pressure in "corrected" inches of mercury.

Next, it is to be noted that the linkage system between the float and pen magnifies the differential in inches of mercury by a factor M (= 13.57) so that the pen indicates the value of the differential pressure in inches of water. Hence, if we have first obtained the differential pressure in "corrected" inches of mercury, multiplying this value by M will give the corresponding value in "corrected" inches of water. Now, the product obtained by multiplying a given quantity by two factors is independent of the order in which the factors are used. Therefore, the same result will be obtained if the "uncorrected" inches of mercury are multiplied first (mechanically) by the magnification factor M, to give "uncorrected" inches of water, and then this quantity is multiplied (manually) by the appropriate gas-mercury manometer factor to give "corrected" inches of water. Hence, with a mercury and float type of recording differential pressure gage, we will use the gas-mercury manometer factors regardless of the units employed for the indicating element of the gage.

As an (extreme) illustration of the possible effects of difference in elevation of pipe line and recorder, and the temperatures of the pressure connections assume that a gas having a specific gravity G, referred to air, of 1.46 is being metered with an orifice meter under the following conditions:

$p_1 = 125$ psia.
$h = 90$ in water at 60° F.
$T_1 = 70°$ F. average temperature of high-pressure connection
$T_2 = 90°$ F. average temperature of low-pressure connection
$Z = 50$ ft.

First, let it be assumed that h is the observed reading of a simple U-type water manometer so that $\rho_w = 62.367$ lb. per cu. ft. For the conditions given above:*

$$\rho_a = (2.7025 \times 125/530 \times 1.46$$

$$= 0.9306 \text{ lb. per cu. ft.}$$

This value may be used in Equation 5 to give the manometer correction factor only; thus:

$$p_1 - p_2 = \frac{90 \times 62.367}{1{,}728}\left(1 - \frac{0.9306}{62.367}\right)$$

$$= 3.248 \times 0.985 = 3.200 \text{ psi.} \quad (7)$$

Before we can proceed with the computation of the effect of the 50-ft

*For an equation by which to compute the density of a gas, see A.S.M.E. Fluid Meters Report, fourth edition, par. 84, and Equation 100(b).

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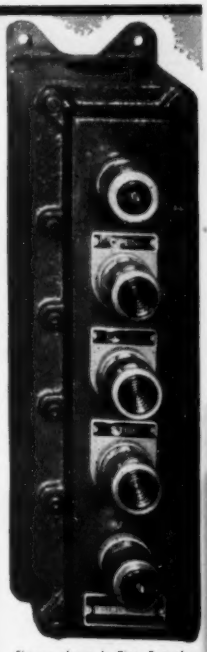

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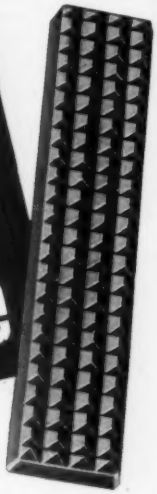

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difference in elevation combined with the difference in the gas densities within the connection lines, as given by the right-hand term of Equation 6, it will be necessary to compute ρ_z. In order to do this, the value of p_2 is required, and we have the choice of two procedures. The first is to use the result obtained above by the use of Equation 5 to give a first appropriate value of p_2. With this value of p_2, values of ρ_z and the elevation density term are computed, and a second and closer approximate value of p_2 is obtained. Then, if it seems worthwhile, the process may be repeated to obtain more exact values of the correction term.

The second, which is the mathematically proper procedure, is to use the relation:

$$\rho_z = \frac{2.7025\, p_2\, G}{460 + T_z} \qquad (8)$$

in Equation 6 to give the following expression for the value of p_2:

$$p_2 = \left[p_1 - \frac{h\rho_L}{1.728}\left(1 - \rho_a/p_1\right) + \frac{Z\rho_a}{144} \right] \times \left[\frac{144\,(460 + T_z)}{144\,(460 + T_z) + 2.7025GZ} \right] \qquad (9)$$

In using Equations 8 and 9, it is still necessary to compute the elevation-density correction term if this is of interest. For the sake of illustration, the results by both procedures are given.

By the first procedure, the approximate value of p_2 is 121.80 psia. and that of ρ_z is 0.8738 lb. per cu. ft.

The elevation-density term of Equation 6 is:

$$\frac{50 \times 0.9306}{144}\,(1 - 0.8738/0.9306)$$

$$= 0.0197 \text{ (or } 0.02 \text{ very nearly)}$$

and thus the second (approximate) value of p_2 is 121.82 psia. Obviously, the effect of the small change in the value of p_2 will have no appreciable effect upon the elevation-density correction term.

By the second procedure, we have by Equation 9:

$$p_2 = (125.00 - 3.200 + 0.323) \times \left(\frac{79.200}{79.200 + 197.3}\right) = 121.82 \text{ psia.}$$

Since, by the use of Equation 5 alone the approximate value of p_2 was 121.80, it is evident that the elevation-density correction term amounts to 0.02 psi. as found by the first procedure.

Now let us suppose that in the above example the differential pressure had been measured with a mercury recording gage "geared" to indicate inches of water. The actual mercury column providing the balancing pressure between p_1 and p_2 is, approximately:

$$90 \times \frac{62.367}{846.322} = 6.632 \text{ in.}$$

by Equation 5:

$$p_1 - p_2 = \frac{6.632 \times 846.322}{1{,}728}\left(1 - \frac{0.9306}{846.3}\right)$$

$$= 3.248 \times 0.9989 = 3.245 \text{ psi.}$$

Following the first procedure discussed above, the value of the elevation-density correction term is 0.0199 (i.e., 0.02 as before). Thus, the adjusted differential pressure is 3.225 psi., as compared with 3.18 psi. when an ordinary water manometer was used.

BOOKS

ADSORPTION. By C. L. Mantell. Published by McGraw-Hill Book Co., Inc., 330 West Forty-second Street, New York. 634 pp. $9.

Adsorption has come of age and has become a favorite theme of symposia in chemical-engineering groups. Petroleum processing has developed many large-scale applications of adsorption. The petroleum chemist will enjoy the chapter on fractionation of hydrocarbons which complements and supplements multiplate fractional distillation and azeotropic methods. The chapter on hypersorption was written with the cooperation of Berg of Union Oil Co. of California and Kehde of Foster Wheeler. Applications of hypersorption are recovery of propane and butanes from natural gas; processing of refinery-gas streams, removal of nitrogen from natural gas, purification of hydrocarbon synthesis gas, acetylene recovery from oxidation gases, and hydrogen recovery. Hypersorption, after several years of commercial operation, has now become well established as a fundamental chemical-engineering tool. Gas hydrates is presented concisely and relies on the work of Roberts, Brownscombe and Howe, Hammerschmidt, Deaton and Front, Carson and Katz. Other practical chapters include those on fuller's earth and activated clays, dehydration of air and gases, water treatment, and ion-exchanger applications. A 20-page appendix contains 16 tables of thermodynamics, specific heats, heats of vaporization, and adsorption. In addition to the 133 tables there are 263 illustrations.

This second edition, brought up to date, fills the need of the operating man as well as the researcher and graduate student.

THE PRACTICAL ENGINEER POCKET BOOK, 1951, edited by N. P. W. Moore. Published by Pitman Publishing Corp., 2 West Forty-fifth Street, New York 19. 744 pp. $3.

This handy pocket-sized book, which is in its sixty-third year of issue, has been thoroughly revised. Type has been reset, many of the illustrations redrawn, and separate sections rearranged in a more logical sequence. Despite these changes however, the traditional character of the book has been retained. The internal-combustion-engine section has been extended to include information on properties of compression-ignition-engine fuels, and a brief section has been added on the supercharging of engines. In view of the growing importance of the gas turbine, a new section has been included to serve as an introduction to this specialized aspect of power engineering. Basic data on proposed unified standard screw threads have been included. A German dictionary has also been added.

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QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

This department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in various phases of plant operation, as well as those connected with the marketing and utilization of petroleum products. Readers are invited to submit their problems to W. L. Nelson, technical editor. Inquiries must be signed, but only the initials will be printed.

Relative Value of Coal and Fuel Oil

Note: A continuation of the discussion of "Relative Cost of Coal and Oil Firing," which appeared in the July 12, 1951, issue.

In the July 12, 1951, issue of this page it was found that about 4.25 bbl. of Bunker C or A.S.T.M. No. 6 fuel oil is the equivalent in heating value of 1 ton of bituminous coal. Oil can be fired more efficiently than coal, and the value of efficiency in cents per ton of coal is about 6 to 10 cents. The equipment required for oil firing (storage, lines, pumps, controls, burners, etc.) is cheaper than the bins, chutes, conveyors, grates, etc., required in handling coal. However, the real advantage of oil firing lies in the very much smaller labor cost when firing oil. Except for fireman, no labor is required to fire oil, whereas coal must either be shoveled by coal passers or an expensive and elaborate conveying system must be installed and maintained (and the conveyor continually requires power). This leads in general to the conclusion that 4.25 bbl. of fuel oil can be fired for 15-25 cents less than the cost of firing a ton of coal. If manual handling must be employed, the extra cost of firing coal may amount to even 1.50 per ton.

The cost of handling is forcefully emphasized by the relative costs of bunker coal and of industrial coal (in cars at destination). Average prices per net ton were published in the Minerals Yearbook of the U. S. Department of Commerce, as shown in Table 1. Scarcely any bunker coal has been used since 1940. Incidentally, the case of firing fuel oil is given no credit in Table 1.

The average prices of coal are indicated in Table 2. The value of fuel oil relative to coal can be estimated from Table 2 by adding a credit for ease of firing fuel oil to the coal price at destination and dividing by about 4.25. This provides the values shown in Table 3 when credits of 15 to 60 cents are added to the per ton costs of coal (3.5 to 14 cents per barrel of fuel). From this standpoint it appears fuel oil has commanded a higher price than coal up to the year 1948 but lately has been competing vigorously for the market served by coal.

The same figures may be analyzed in another manner. It may be assumed that the two fuels have always been competitive, and the difference in their values is the bonus commanded by fuel oil because of its better firing characteristics. On this basis, the bonus for fuel oil is of the magnitude shown in Table 4. The very large bonuses that have been paid for fuel oil in the past, indicate that the price of fuel oil has been supported by other uses than the burning of it in competition with coal. From the discussion of firing costs in the July 12, 1951, issue of this page, it was concluded that the bonus for fuel oil should be only 3 to 12 per cent and perhaps 18 per cent if much manual handling is required. Thus, fuel oil can reach by sea, many ports that are far removed from coal mines and can be delivered inland at a freight charge comparable with that for coal. Fuel oil is eminently suited for the bunkering of vessels.

TABLE 1—APPROXIMATE PRICES OF AVERAGE AND BUNKER BITUMINOUS COAL, $ TON

	In cars at destination	Bunker coal	Houston fuel price times 4.25 plus 50-cent tanker cost
1932	$3.57	$4.10	$2.63
1934	3.90	4.39	4.33
1935	4.10	4.66	3.69
1937	4.07	4.83	4.33
1940	4.10	4.81	4.11

TABLE 3—ESTIMATE OF THE VALUE OF FUEL OIL

(Based on a credit of 3.5 to 14 cents per barrel of fuel oil.)

	Value based on coal	Price at East Coast ports*
1932	$0.87-0.94	$1.00
1933	0.85-0.93	1.15
1934	0.94-1.02	1.40
1935	1.00-1.08	1.20
1937	0.99-1.07	1.35
1940	1.00-1.08	1.30
1944	1.22-1.30	1.35
1945	1.26-1.34	1.40
1946	1.31-1.39	1.70
1947	1.62-1.70	2.20
1948	1.86-1.94	3.00
1949	2.06-2.14	1.85
1950	2.03-2.12	1.90
1951 (March)	2.04-2.12	2.00

*Approximate.

TABLE 2—APPROXIMATE PRICES OF BITUMINOUS COAL AND FUEL OIL

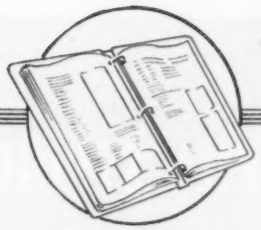
	Retail†	Bunker†	At mine†	Average† freight	At destination in cars		Bunker C fuel oil, $/bbl. Houston	Tanker rate*	Eastern ports
1932	$7.71	$4.10	$1.31	$2.26	†$3.57		$0.50	$0.50	*$1.00
1933	7.65		1.36		*3.50		0.65	0.50	*1.15
1934	8.26	4.39	1.75	2.15	†3.90		0.90	0.50	*1.40
1935	8.30	4.66	1.89	2.24	†4.13		0.75	0.45	*1.20
1937	8.58	4.83	1.90	2.17	†4.07		0.90	0.45	*1.35
1940	8.60	4.81	1.88	2.22	†4.10		0.85	0.45	*1.30
1944			*2.80		*5.00	†5.24	0.90	0.45	*1.35
1945			*2.95		*5.15	†5.36	0.95	0.45	*1.40
1946	10.95		2.11	2.27	†5.38	†5.83	1.22		1.70
1947	12.99		4.15	2.49	†6.64	†6.88	1.70		*2.20
1948	15.40		4.95	2.71	†7.66	†7.88	2.40		3.00
1949			*5.50		*8.50	†8.81	1.40		1.85
1950			*5.40		*8.40	†8.70	1.70		1.90
1951 (March)			*5.50		*8.45	*8.75	*1.75		2.00

*Estimate. †Minerals Yearbook, U. S. Department of Commerce. †Wholesale Prices, Bureau of Labor Statistics, U. S. Department of Labor.

TABLE 4—BONUSES PAID FOR FUEL OIL (OR COAL) SINCE 1932

	4.25 times Eastern port fuel price	Bonus paid for fuel oil, per 1 Ton coal	1 Bbl. fuel	Percentage†
1932	$4.25	$0.68	$0.16	19
1933	4.89	1.39	0.33	40
1934	5.95	2.05	0.47	52
1935	5.10	0.97	0.23	24
1937	5.73	1.66	0.39	41
1940	5.52	1.42	0.33	35
1944	5.73	0.73	0.17	15
1945	5.95	0.85	0.20	16
1946	7.22	1.84	0.43	34
1947	9.35	2.71	0.64	41
1948	12.72	5.06	1.19	66
1949	7.86	*(0.64)	*(0.15)	*(7.5)
1950	8.07	*(0.33)	*(0.08)	*(3.9)
1951 (Mar).	8.50	*(0.05)	*(0.01)	*(0.6)

*Negative—meaning a premium paid for coal. †Based on coal price.



THE REFINER'S notebook

No. 80

Factors Affecting Throughput in Cat Cracking

by P. M. Reynolds*

Part 4. Feedstock Evaluation

COKE-LADEN catalyst is returned continuously to the regenerator where the coke is removed from the catalyst by controlled burning. The regeneration temperature is usually held between 1,050° and 1,100° F., but must be limited to 1,125° F. to prevent metal failure of the regenerator vessel itself and to prevent damage to the catalyst. Catalyst circulating back to the regenerator removes the largest portion of the heat of combustion of the coke and the remainder of the heat goes out with the flue gases in the general case. Fluid units designed to handle a high per cent of carbon to feed have catalyst coolers through which catalyst is circulated to and from regenerator and subsequently cooled.

Regeneration capacity is usually one of the limiting factors in the throughput of a catalytic cracking unit. The superficial average flue-gas velocity in the regenerator should be kept below 2.2 ft. per second to prevent excess catalyst carryover loss in the exit flue gases. When all of the combustion air required to give this limiting velocity of 2.2 ft. per second in the regenerator is used, then the coke-burning capacity of the unit is reached and coke formation in the reactor must not be allowed to go any higher. Blower capacity for combustion air need not be any higher than enough to reach this maximum allowable regenerator velocity.

*Process engineer, Mid-Continent Petroleum Corp. Paper presented at second annual John Zink Process Heating Seminar, Tulsa.

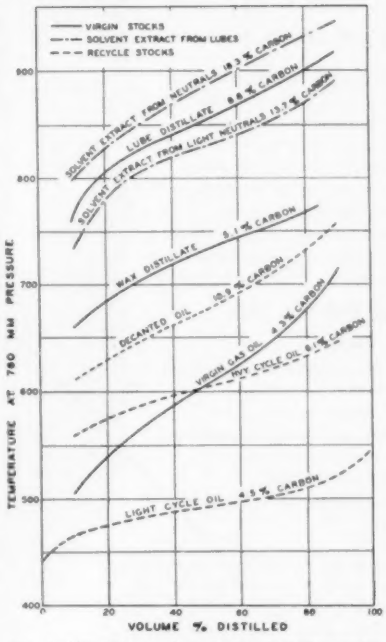


Fig. 1—Catalytic cracking feedstock carbon-production-boiling range relationship.

Feedstock

Pilot or bench-scale results do not coincide with commercial operations due to the large number of variables encountered in the actual operation of a unit. Therefore each refiner needs to evaluate relatively each of his feed stocks available. Some recent investigations show that one of the best methods for evaluating a feed stock is the use of aromaticity measured by specific dispersion but very little information has been obtained on this basis because the test is difficult to run—the dark color interferes with the test. Mid-Continent has evaluated feed stocks on a bench-scale apparatus using modifications of an activity tester. The equipment used is a modification of the Atlantic activity testing apparatus. Oil is heated and charged to the vessel containing catalyst. The products are condensed and fractionated. The catalyst is removed from the reactor and coke test run on it. All tests are run with the same amount of oil and catalyst and at the same temperature. Fig. 1 is a plot of distillation curves of various cat cracker feed stocks with the carbon production on the activity tester written on each curve. All tests were run under the same conditions, thus only relative carbon-forming tendencies are obtained: Correlation is not shown relating the carbon formation between the three general types shown. But within any group, the carbon primarily is a function of the boiling range of the stock—the higher-boiling materials form more carbon. This type of test eliminates most of the operating variables of commercial units. However, some of these data do not correspond accurately with actual plant operation. This is the first step in prediction of coke, gas and gasoline yields of a particular feed stock.

Feed preparation other than topping and reducing crude for gas oils now being used by several companies are viscosity breaking, delayed coking, and propane decarbonizing. These methods are used primarily to reduce coke and gas yield tendencies and catalyst poisoning from residual nitrogen, sulfur, and metals. Residual stocks are not usually fed directly to a catalyst cracking unit without some cleanup. Some refiners are proceeding with feed cleanup by solvent extraction of aromatics and naphthas from stocks recycled within the cracking unit itself. The results of this type of operation with regard to conversion to gasoline, coke, and gas are not yet certain.

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Effect of Formation-Volume Factor on Water-Flood Recovery

IN electing to carry on a water-drive recovery for a reservoir there is often the choice of so doing early in the life of the reservoir or after the reservoir has been naturally depleted by solution gas drive. Some of the advantages attendant to flooding before the pressure is dissipated are due to the more desirable fluid characteristics such as lower oil viscosity and greater reservoir oil volume. Quantitative effects due to the latter are calculated in this discussion.

It is generally accepted that the residual oil remaining after a water flood does not depend upon oil density or oil viscosity and is insensitive to small changes in interfacial tensions. As a first approximation, therefore, the amount of oil residual, in terms of reservoir space occupied, could be considered to be the same whether the flood took place before or after reservoir pressure depletion.

If the flood occurred at original pressure the reservoir oil residual would be S_{or}/β in terms of stock-tank equivalents. If the flood occurred after depletion the reservoir oil residual would be stock-tank oil, equal to S_{or}. The difference in stock-tank residual oil between these two conditions is therefore $S_{or}\ (1 - 1/\beta)$, which represents the additional oil recovery.

The amount of additional oil, of course, depends upon β. Fig. 1 is a plot of the above expression showing increased oil recovery in per cent of pore space as a function of the absolute oil residual value and the formation-volume factor. It is apparent that the difference is more sensitive to formation-volume factor at low factors than at high factors.

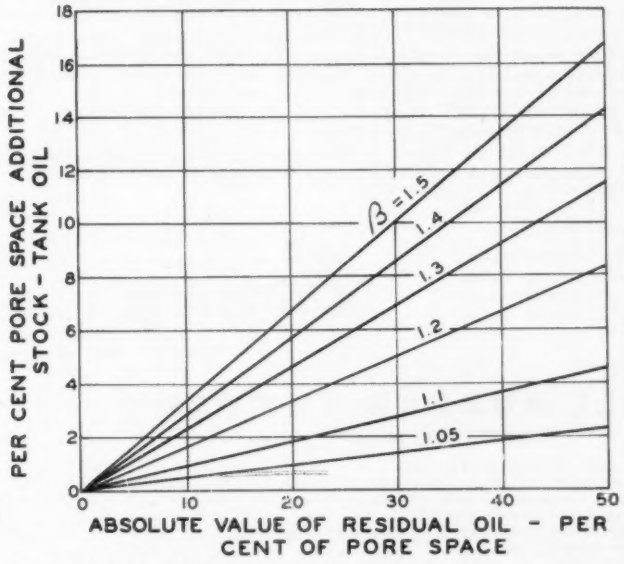

Fig. 1—Additional stock-tank oil to be recovered when flooding at high formation-volume factors.

This same argument could be used to estimate the additional stock-tank oil to be recovered by repressuring a depleted reservoir oil to a predetermined formation volume by injecting gas prior to water flooding. Thus, if the expected oil residual were 25 per cent, injection of sufficient gas to raise the formation volume factor to 1.10 would result in an additional oil recovery equal to 2.3 per cent of the pore space.

This reasoning assumes, as first stated, that the absolute value of oil residual would be the same at either time of water flooding. Of course, factors other than a change in fluid properties enter when flooding at high reservoir pressure is compared with flooding at depletion. In particular, when flooding occurs at primary reservoirs there is likely to be no free gas space. Recent experiments[1] indicate that free gas spaces in the reservoir have an important effect on oil residual. If this is true then the advantages due to presence of free gas at depletion flooding may overshadow the advantages due to the formation volume factor at high pressure flooding.

This analysis does not consider either the additional oil possibly to be recovered during the solution gas drive following the water flooding of a primary reservoir at high pressures. That solution gas drive may produce some oil even at fairly high water saturations is attested to by published results.[2]

It is apparent that a consideration of time to water flood could not be decided solely on the basis of the benefits due to flooding at higher reservoir oil saturations, but would have to be decided after considering all other variables as well. The effect due to increased formation volume factor is one of the few variables that can be evaluated at this time.

References

1. Holmgren and Morse, Effect of Free Gas Saturations on Oil Recovery by Water Flooding, Petroleum Technology, May 1951.
2. Botset and Muskat, Effect of Pressure Reduction Upon Core Saturation, A.I.M.E. Trans. 1939, Vol. 132.

Series by Dr. John C. Calhoun, Jr., Chairman, Petroleum Engineering School, Penn State College

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2 MECHANS PIPES. Riveted and electrically welded-steel pipes (6-in. diameter and upwards) for water, oil, gas, exhaust steam, and hydroelectric schemes are described in Catalog No. 5. *Mechans, Ltd.*

3 OIL PIPE LINE is a 26-page English brochure describing and illustrating the Crossley-Premier 16-cylinder oil engine with a power rating of 2,000 b.hp. Each engine drives an alternator, without switchgear, to a 1,800-hp. induction motor. Details of construction and dimensions are shown. *Crossley-Premier Engines, Ltd.*

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21 SPIRAL WOVEN WIRE CONVEYOR BELTS. Catalog 31 contains 40 pages of illustrated standard and special types of wire-belting weaves with specifications and detailed descriptions. *Korb-Pettit Wire Fabrics & Iron Works, Inc.*

22 MULTILAYER HEAT EXCHANGERS adaptable to a wide range of high-pressure services is explained in bulletins and information now available. *A. O. Smith Corp.*

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24 AERIAL SURVEYS SAVE TIME AND MONEY is a reprint of an article dealing with case histories of users of aerial surveys. Illustrations cover such subjects as mosaics, enlargements, and transfer of data from stereoscopic photos to maps. *Abrams Aerial Survey Corp.*

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THE OIL AND GAS JOURNAL
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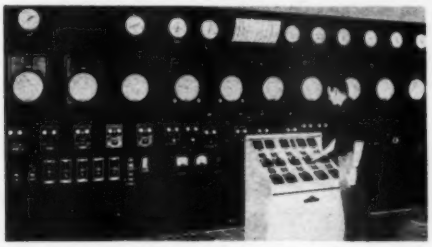
TULSA, OKLAHOMA

OIL AND GAS EQUIPMENT Digest

IT'S NEW CHECK IT

by Dan B. Miller

25 MINI-LINE INSTRUMENTS make it practical to concentrate into a small space, before a single operator, all information and controls for operating one or more boilers, turbines, or process units such as in chemical plants and refineries. Space savings are considerable. A new multipoint indicator uses 87 per cent less space than its standard-size counterpart. A selector valve uses 52 per cent less space, and a remote manual relay uses 70 per cent less space. It is planned to mount Mini-Line instruments on console-type centralized-control panels whenever possible. Control from a centralized-control panel may be entirely automatic, or if the operator wishes, individual units or the entire system may be controlled manually from relays at his finger tips. Comparison of a control panel utilizing instruments of conventional type vs. a bench-type panel utilizing Mini-Line equipment is illustrated. *Bailey Meter Co.*

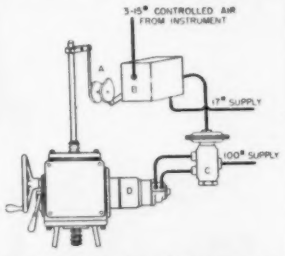


IT'S NEW CHECK IT

26 FIBERGLAS PIPE LINE ROCK SHIELD, for use during pipe-wrapping operations in rough terrain, protects pipe in rocky areas, at river crossings, in swamps, at railroad or road crossings, and wherever pipe encounters rough handling. It is a prefabricated cushioning material of high-impact strength, made of bitumen blended with inorganic filler and reinforced with Fiberglas Coromat inner wrap. It is applied by a two-man crew with pressure-sensitive tape or metal strap and is made in roll or sheet form. *Owens-Corning Fiberglas Corp.*

IT'S NEW CHECK IT

27 CONO ROTOMOTOR has been adapted for the operation of catalyst slide valves on throttling-control services. A completely pneumatic gear-driven operator insures accurate, sensitive, and positive positioning of these large valves commonly used for the handling of spent and regenerated catalyst and back pressure control of flue gases, etc., on catalytic cracking processes. Operating through a gear drive and threaded stem, Rotomotor is basically a self-locking mechanism: A continuously connected handwheel and declutching lever also provide for manual operation if desired. Repositioning is accomplished by means of a tape-type positioning device which permits long travels with accuracies of valve-stem positioning to within 1/500th part of the total valve stroke. Rotomotors are available in a number of models for various travels, speeds, stem diameters, and thrust loads. *Conoflow Corp.*



IT'S NEW CHECK IT

28 ARPS-HAMILTON LOGANALYZER is a modern slide rule for rapid conversion of electric-log millivolts and ohms to porosity, water saturation, oil saturation, and permeability. It provides a practical quantitative log analysis in your pocket at all times, and elimi-

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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. . . to an old engineering head, these features speak for themselves.

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- Special mounts for bearings insure against damage to the gear box itself.
- Positive lubrication of all bearings.
- Gear box has full roller bearings.
- Has large-area clam shell brake.
- Sediment trap designed in best workable location.
- Oiling is off of intermediate gear instead of low speed for quicker supply.
- Cover of box is easily removed for inspection.

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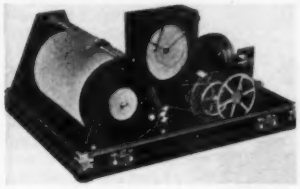
nates cumbersome charts and complicated data sheets. Obtains porosity and water saturation automatically by Tixier method and water saturation by the Archie method. It clarifies and simplifies log quantitative relationships. The case is Vinylite plastic with black scales on both sides. White Vinylite slide has scales in red and black. Instructions for use are on the case. *Hamilton Well Log Consultants.*

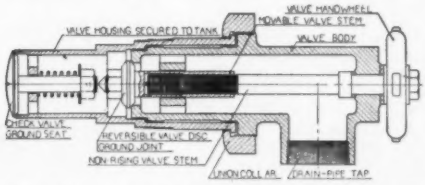
IT'S NEW CHECK IT

29 NEW RECORDING MICRO BAROGRAPH. Easy to use and producing dependable results, this new instrument is of importance to geophysicists, geologists, surveyors, and engineers. It is constructed on the Nul, or Zero-gaging principle, using a pressure - sensitive device. All power in the actuating and recording mechanism is supplied by two heavy-duty sealed instrument clocks and no power is taken from the pressure-sensitive device. It records a pressure curve over a range of plus or minus 1.00 in. mercury and can be used at any elevation from sea level to 10,000 ft. by means of a convenient reset. The 24-hour chart is graduated in intervals of 0.005 in. mercury easily read to 0.001 in. mercury. Chart time is divided into intervals of 10 minutes, readable to 1 minute. Curve is drawn on a specially surfaced paper by a metallic point and no ink is used. *American Paulin System.*



IT'S NEW CHECK IT

30 WATER DRAW-OFF VALVE results in a substantial reduction in the number of frozen valves in refineries. Valve is available in both 2 and 3-in. sizes. Its unusual construction enables the outer part of the valve to be removed for repairs or replacement without draining the entire tank. *Airetool Manufacturing Co.*



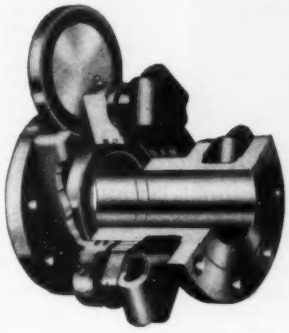
IT'S NEW CHECK IT

31 TK-43 is a rubbery-type copolymer baked-on plastic coating, which is finding many applications in the oil industry. TK-43 is especially adapted where the flow of abrasive solids presents a problem, because of its extra thickness and smooth, tough, durable nature. It is applied to the metal surface in multiple coats to produce a film thickness up to 30 mils, which provides a high degree of resistance to abrasive solids flowing through the pipe. It is particularly useful on sucker rods and tubing. It is inert to most corrosive chemicals at normal temperature. It has low absorption and low vapor transmission rates. It is dense, having high molecular weight with resin particles thoroughly fused together during the baking process. *Tube-Kote, Inc.*

OIL AND GAS EQUIPMENT Digest

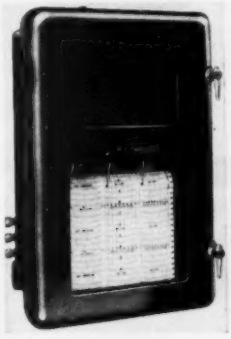
IT'S NEW CHECK IT

32 FLUID SAVER TYPE LINE BLIND VALVE combines spill-proof and self-aligning features with simplified three-bolt operation. By turning the operating bolts with a short, straight bar one man can release the spectacle plate, reverse it, and seal it securely again in less than 1 minute. The two-piece body has telescoping hubs which slide one within the other, with internal packing between them. This design provides a fully enclosed chamber for the spectacle plate and also makes the line blind valve resistant to sidewise strains due to misalignment of the piping, or its expansion or contraction under changes of pressure or temperature. Available in sizes from 2 to 8 in. with A.S.A. 150-lb. flanges. Face-to-face dimensions are the same as American Standard 150-lb. steel wedge gate valves. *Hamer Oil Tool Co.*



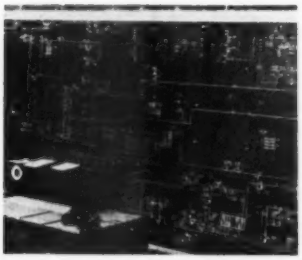
IT'S NEW CHECK IT

33 MULTIPOINT AIR-OPERATED RECEIVER RECORDER. It provides a synchronized side-by-side record of the principal measured or controlled variables in a system. It can be used in conjunction with a transmitter mounted in any of the standard Kent instruments (mercury or ring-balance type for flow, Multelec potentiometers, pressure or temperature controllers) or with transmitters of other makes provided that they emit the required pressure range. The receiver records on a chart divided into three distinct zones and can operate on three, four, five, or six points. When it is operating on more than three points, and two pens are recording on one zone, different colored inks are used. Each pen is provided with a separate "zero" adjuster. The chart is driven by a synchronous electric motor and at the standard speed will last for 2 months. The instrument includes an air filter, pressure-reducing valve, moisture sump, and pressure gage. *George Kent, Ltd.*



IT'S NEW CHECK IT

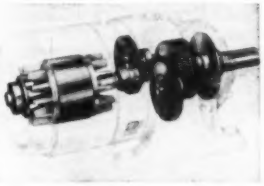
34 FLEXIBLE PLANT DIAGRAM BOARD is for use in plant control room. Panel boards are of ⅛-in. material, perforated with round holes arranged in straight rows on ¼-in. centers. Panels are finished in dark green and diagrams of the systems are indicated by strips of colored scotch tape with adhesive letters, figures, and



symbols. Plastic pins of different colors inserted at proper positions indicate temporary changes. Operator has in front of him at all times a complete plant picture of system showing required details of equipment. *Harrington & King Perforating Co.*

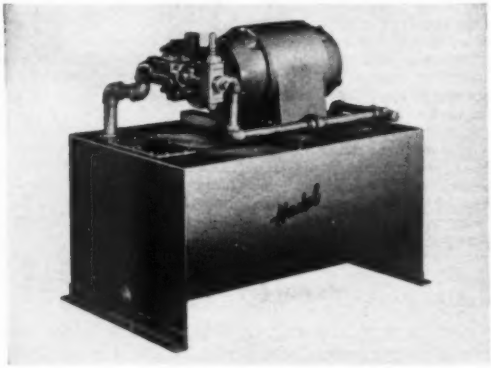
IT'S NEW CHECK IT

35 NEW TWIN-PINION SYNCROGEAR MOTOR. By using two secondary pinions to drive the output gear, engineers have doubled the effective torque rating of a conventional single pinion and gear unit. Incorporating the use of a splined herringbone pinion to equally divide the load between the two secondary pinions, the type GL Syncrogear produces high torque at low speeds while occupying only a small space. Available in ratings of 5 to 25 hp. and with speeds from 30 to 84 r.p.m. The GL has the advanced features of asbestos-protected windings, normalized castings, solid centricast rotors, and Lubriflush lubrication. *U. S. Electrical Motors, Inc.*



IT'S NEW CHECK IT

36 HYDRAULIC POWER UNITS combines reservoir, pump, and motor into a compact, efficient unit. The line contains 224 standard models that are manufactured



in three basic standard series. Low-pressure units which supply up to 1,750 psi. pressure and range from 1½ to 50 g.p.m. in single-pump models or to 100 g.p.m. in double-pump models. Hi-Low units provide a dual pressure source by combining a high-pressure and low-pressure pump with automatic unloading of the low-pressure pump. Hi-pressure units supply up to 10,000 psi. pressure range from 1½ to 5 g.p.m. in single-pump models and to 10 g.p.m. in double pump models. *Haskel Engineering & Supply Co.*

IT'S NEW CHECK IT

37 ALUMINUM MARINE AND BARGE HOSE. Developments in the design of all-metal loading and unloading lines, including the use of aluminum tubing and aluminum swivel joints, are now available to industry. One of the primary advantages is the saving in weight which makes the metal hose easy to handle. Another is the fact that the hose is not affected by severe temperature and climatic conditions. Aluminum hose will handle many types and kinds of products. Operating experience shows that connections can be made by one man in less than 10 minutes. When not in service, the hose is swung back to the mast without requiring disconnection from the dock riser. *Chiksan Co.*

IT'S NEW CHECK IT

38 NEW DIESEL-POWERED LIFT TRUCK. A new industrial fork-lift truck with a hydraulic transmission is specifically designed for applications where fire hazards exist, where there is a limited amount of fresh air, and in outdoor areas where continuous heavy-duty operation is a necessity. The new Yale truck utilizes a Hercules six-cylinder diesel with a continuous rating of 70 hp. All power impulses from the engine are transmitted through a double-impeller fluid coupling. The new Diesel-Lift has a condenser-type water muffler which screens out sparks in the exhaust gases for further safety. A long wheel base and especially wide wheel treads provide the stability and mobility required to handle heavy loads over rough yards. *The Yale & Towne Manufacturing Co.*

IT'S NEW CHECK IT

39 KODAGRAPH AUTOPOSITIVE PAPER, TRANSLUCENT, a tough, durable, and highly translucent new drawing-reproduction paper is designed to meet exacting requirements in the drawing-copy field. The new paper is coated with the same emulsion used on "regular" Kodagraph Autopositive Paper. The paper on which the emulsion is coated, however, is considerably tougher and will withstand longer and rougher handling without tearing. This assures greater life on the drafting board and in the reproduction department. Another feature is the ease with which drawing changes can be effected. Lines erase readily when moistened. *Eastman Kodak Co.*

REFINING

Skelly Making Progress On Longview Plant Plans

LONGVIEW, Tex.—Skelly Oil Co. is well along with engineering and design of a platforming and polymerization unit as part of the expansion and modernization program at its refinery here.

Skelly plans to increase the crude capacity of the refinery by approximately 20 per cent by modernization of existing facilities, and to install a 1,500-bbl. daily charge capacity platforming unit and a catalytic polymerization unit of adequate size to balance the refinery operation.

Engineering, design, and construction of the equipment will be handled by Universal Oil Products Co. and its subsidiaries. The engineering is now largely completed and present plans call for breaking ground for the construction in the next 2 or 3 weeks.

It is expected that this phase of the modernization and expansion program will be completed some time the latter part of March 1952.

New Petrochemical Process

B.A.-Shawinigan, Ltd., newly formed Canadian petrochemical company which will construct a plant at Montreal East, Que., will employ petroleum-derived cumene as a basic stock for the synthesis of phenol and acetone.

The joint owners, British American Oil Co., Ltd., and Shawinigan Chemicals, Ltd., announce that they will operate the plant under patents licensed from Hercules Powder Co., Wilmington, Del., and Distillers Corp. of Edinburg, Scotland.

Cumene, derived from British American's adjacent refinery, will be cumene hydroperoxide which in turn will be split to obtain phenol and acetone.

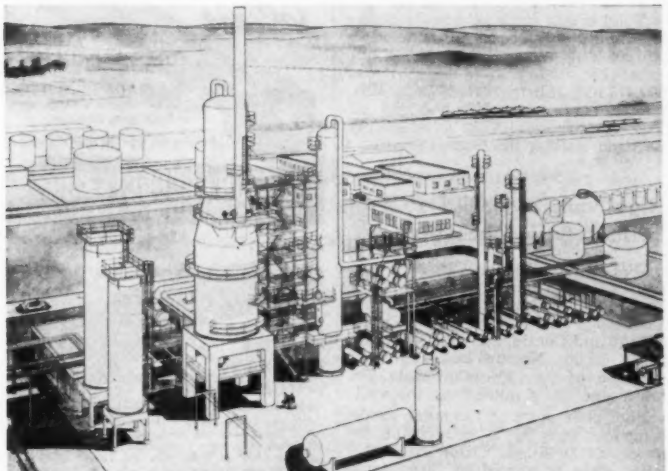
The Canadian Kellogg Co., Ltd., of Toronto has been awarded the contract for design and construction of the new plant. Initial operation is anticipated by late 1952.

Gulf Offers New Oil

Gulf Oil Corp. has announced the addition of a new premium oil for service-station sales. Called Gulfpride H.D. (for high detergency) the new grade comprises a 100 per cent paraffinic solvent refined stock containing detergent-dispersants and other additives.

New Detergent Production

The current tight supply situation on detergent lube-oil additives will be somewhat alleviated by the initial



This new Orthoflow fluid catalytic cracking unit is now almost 50 per cent completed at the Ponca City, Okla., refinery of Cities Service Oil Co. (Del.). The 8,300 bbl. per day unit, together with a light-ends recovery unit, is designed and engineered by M. W. Kellogg Co. and is the first such cracking unit to be built in this country. The first Orthoflow unit is now going on stream at the complete new Edmonton, Alta., refinery of British American Oil Co., Ltd.

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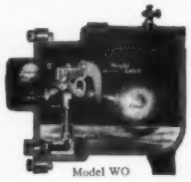

Top trap for press. to 650 lbs.; bottom, to 1500.
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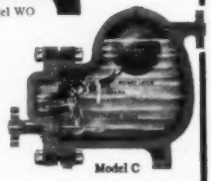
Both types widely used for discharging gasoline, water and oil.



Model C

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production of oil-soluble sodium sulfonates at Shell Oil Co.'s Martinez, Calif., refinery.

One of the first plants to synthesize sulfonates as a primary product from petroleum, the Shell Martinez plant will distribute its expanded production through Shell Chemical Corp. for use in heavy-duty lubricating oils.

Lube-Oil Production Up In May, W.P.R.A. Says

Production of lubricating oils, as well as total shipments, gained in May, Western Petroleum Refiners Association reported this week in its survey of 14 midwestern refineries.

Total bright stock production during the month was 339,641 bbl., compared with 296,343 bbl. the same month a year ago. Last year's figures are based on 13 reporting companies. Included in total bright stock figures was 265,103 bbl. of solvent bright stock, compared with 233,606 bbl. in May 1950.

Total viscous neutrals production was 653,993 bbl., compared with 513,067 bbl. the same month a year ago. This included 536,959 bbl. of solvent viscous neutrals. Production of this product in May 1950 was 400,844 bbl.

Output of paraffin oils totaled 141,614 bbl., compared with 118,615 bbl. the same month a year ago; these include: steam refined stock, which totaled 18,642 bbl., compared with 21,359 bbl. in May 1950; and blended oils, which totaled 656,343 bbl. in May 1951, compared with 575,130 bbl. the same month last year.

Total bright stock shipments during the month was 339,663 bbl., including 276,952 bbl. domestic, and 62,711 bbl. export. Inventory as of May 31 was 299,418 bbl. of bright stock. Days' supply on hand at month's end was 36. This compared with 32 days' supply on hand on May 31, 1950.

High Pour Point Oil Found In Uinta Basin Discovery

DUCHESNE, Utah. — High pour point of 100° F. may present another crude-handling problem for the new Duchesne Unit discovery of Carter Oil Co. and Continental Oil Co. in the Uinta basin. No market has been obtained as yet. The California Co. has a pipe line 6 miles from the well.

High pour point of Duchesne crude compares with 90° F. pour point for Roosevelt field oil. Crude from the latter field is moved in large tank trucks, equipped with steam-heated coils, to Salt Lake City, 140 miles distant, where the crude is delivered to the refinery of Utah Oil & Refining Co.

Both fields produce from fractured shale zone of Green River formation.

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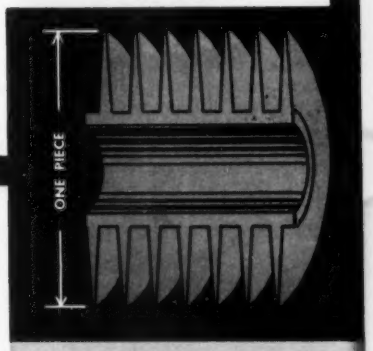
Here's one CERTAIN way you can increase the capacity of your air-cooled condensers



Install WOLVERINE TRUFIN*

You can multiply the capacity of your air-cooled condensers at least twice—sometimes even more—than that of plain tube units of the same size. And, for increased efficiency, the use of Wolverine Trufin greatly increases the condensing surface area in the same amount of space!

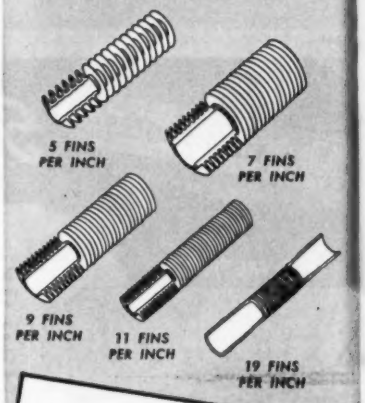
Operational troubles are minimized, too, because the fins of Trufin are extruded from the tube itself. With the fins integral to the tube, they easily stand vibrations and extreme temperature changes.

Yes, Trufin is the answer to many condensing tube problems where you need the utmost in efficient performance. WOLVERINE TUBE DIVISION, Calumet & Hecla Consolidated Copper Company, Incorporated, *Manufacturers of Seamless, Non-Ferrous Tubing*, 1459 CENTRAL AVENUE, DETROIT 9, MICHIGAN.

*Reg. U. S. Pat. Off.

Wolverine Trufin and the Wolverine Spun End Process available in Canada through the Unifin Tube Co., London, Ont.

Trufin is available in many sizes, alloys, and fin spacings in both single metal and bi-metal tubes.



A request on your stationery will bring you Bulletin giving helpful information regarding the use of finned tube in air-cooled condensers. Would you like a copy?

Wolverine Condenser Tubes stocked by Butler Industries, Inc., 355 South Fourth Street, Beaumont, Texas. Tel.: Beaumont 5-2351.

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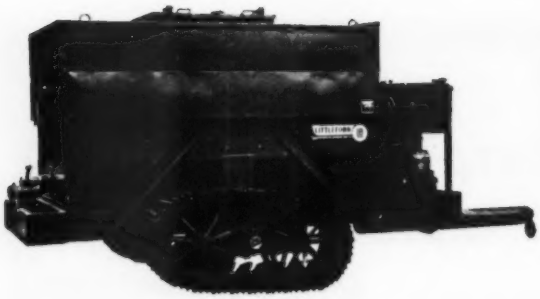

HYDRAULIC AGITATED KETTLE . . . Model 211-30, 30 barrel capacity equipped with hydraulically controlled agitator, low pressure burner, dial type thermometer and a Wisconsin air-cooled gasoline engine with electric starter. The burner distributes heat equally over all parts of the bottom, and is designed to avoid hot spots, thus eliminating replacing bottoms. Available on Athey tracks or on skids. Also available in 23 barrel capacity.

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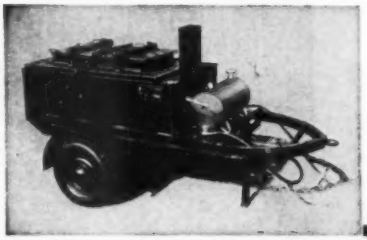

HAND AGITATED PATCH KETTLE. . . Model 84-HD, 225 gallon capacity. This kettle has a manually operated agitator and can be operated from either side. Fast trailing is possible with the Model 84-HD Kettle. A one man operated stiff leg of strong channel iron is provided at the front to support the kettle in the standing position. Also available in 165 gallon capacity.

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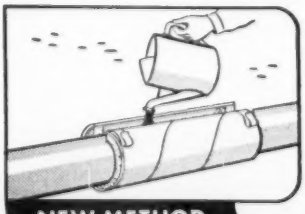
PAT. APPLIED FOR

Slip on - Pour full - Lower in

OLD METHOD



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PIPE LINES

Crude-Oil Lines Held Up Pending Steel Approval

INDEPENDENCE, Kans.—Construction on two crude-oil pipe lines of Sinclair Pipe Line Co. are being held up pending approval of tubular-goods allocation by the Petroleum Administration for Defense in Washington, D. C.

R. J. Tibbets, president of the company, said he did not know what was holding up approval of tubular goods for the two lines, but added that it "just takes so long" for PAD action.

The firm plans to lay a 22-in. crude-oil pipe line from Drumright, Okla., to Sinclair Refining Co.'s refinery in East Chicago, Ind., to supply the Chicago area. Sinclair Oil & Gas Co. and others are involved in the 1,100-mile Platte Pipe Line Co. crude-oil line from Worland, Wyo., to Wood River, Ill., to supply Sinclair and associates farther east.

Tibbets reported that the 16-in. pipe has been obtained for the Platte line between Worland and Casper and beyond, but approval is awaited on the 20-in. for the remainder of the line.

PAD Approves Service Pipe Line Co. Crude-Oil Lines

Petroleum Administration for Defense has approved plans by Service Pipe Line Co. for crude-oil pipe-line facilities to serve added refinery capacity now under construction in Kansas and Missouri.

Pipe lines which will be laid will loop part of the firm's existing multiline system between Drumright, Okla., and Freeman, Mo. The approved projects consist of 29 miles of 20-in.; 19 miles of 16-in.; 2 miles of 12-in.; installation of a 167,000-bbl. tank; and miscellaneous changes in manifolds and pump-station units.

Fifteen miles of the 20-in. will be laid north from the Drumright pump station, and 14 miles north from Blake station in Oklahoma. The 19 miles of 16-in. will be laid from south of Kansas City to Sugar Creek, Mo., and the 12-in. line will be laid to Neodesha, Kans., from the company's mainline system. The tank will be built at Drumright.

Houston Contracting Starts On 96 Miles of 16, 18-In.

HOUSTON. — Houston Contracting Co. has organized two spreads to lay approximately 96 miles of 16 and 18-in. natural-gas line for Mississippi River Fuel Corp. from the vicinity of Ruston, La., to near Marshall, Tex.

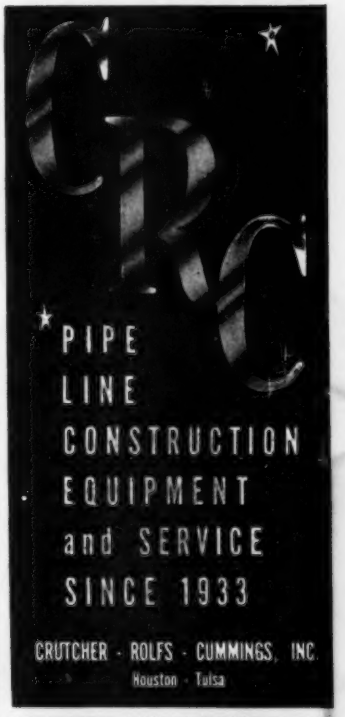
One spread is starting work at Ruston and is working west. E. C. Morris is superintendent; R. E. Thornton, assistant superintendent; and R. J. Axsom is in the office. Pipe laying started on July 12, and headquarters have been established at Arcadia, La.

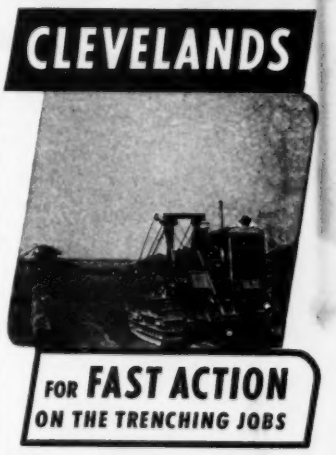
The second spread began preliminary work on July 12, and will begin laying pipe about July 25. It will start at Woodlawn, Tex., and work east. F. A. Silar is superintendent; C. V. Oliver is assistant superintendent; and L. F. Redfearn is in the office. Headquarters are at Marshall, Tex.

In other projects contracted to the firm, Houston Contracting has laid about 25 miles of a 46-mile, 30-in. natural-gas line for Tennessee Gas Transmission Co. from the vicinity of Galion, La., south to the area of Eros, La. W. H. Hayes is superintendent of this spread, which is headquartered at Bastrop, La. M. L. Thompson is assistant superintendent, and J. C. Strickler and J. B. Stoddard are in the office.

Approximately 115 miles of 6, 8, and 12-in. line will be laid and taken up for Interstate Oil Pipe Line Co. in the vicinity of New Iberia, La. H. L. Leak is spread superintendent; S. B. Harrison is assistant superintendent; and H. C. MacWhinnie is in the office.

INTERPROVINCIAL STATION.—Above is the Edmonton, Alta., pumping station of Interprovincial Pipe Line Co., which boosts crude to the east, where the line terminates 1,150 miles away.

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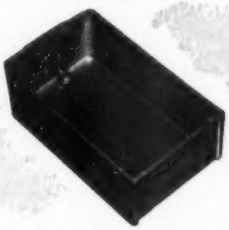

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Brown & Root at Work on 1,795 Miles of Line

BROWN & ROOT, INC., of Houston, is at work on two pipe-line projects totaling 1,795 miles of big-diameter pipe, stretching from the lower Texas Gulf Coast to the eastern seaboard, and also involving a complex submarine pipe-laying project.

HERMAN BROWN

The Houston company, which has had more than 30 years' operation in the heavy-construction field, is doing the engineering on United Gas Pipe Line Co.'s 1,000 miles of expansion in Texas, Louisiana, and Mississippi. It has another contract with Texas Eastern Transmission Corp. for engineering on a line 795 miles long from Mississippi to New Jersey.

The president of Brown & Root is Herman Brown, a native of Belton, Tex. He started out in the construction business in Central Texas with two mules and a grader in partnership with Dan Root, his brother-in-law. Root died in the 1920's, but the name was retained. George Brown, executive vice president of Brown & Root, and brother of Herman, joined the firm shortly thereafter.

L. T. BOLIN

G. R. BROWN

In charge of the company's pipe line activities is L. T. Bolin, a vice president of the firm. He has been with them since 1930. Bolin, an engineer, attended Texas A. & M. College and was general manager of Brown Shipbuilding Co. when that firm built over 350 combat ships for the Navy during the past war.

Builds plants.—Brown & Root has long been associated with the oil industry in the Southwest and has built

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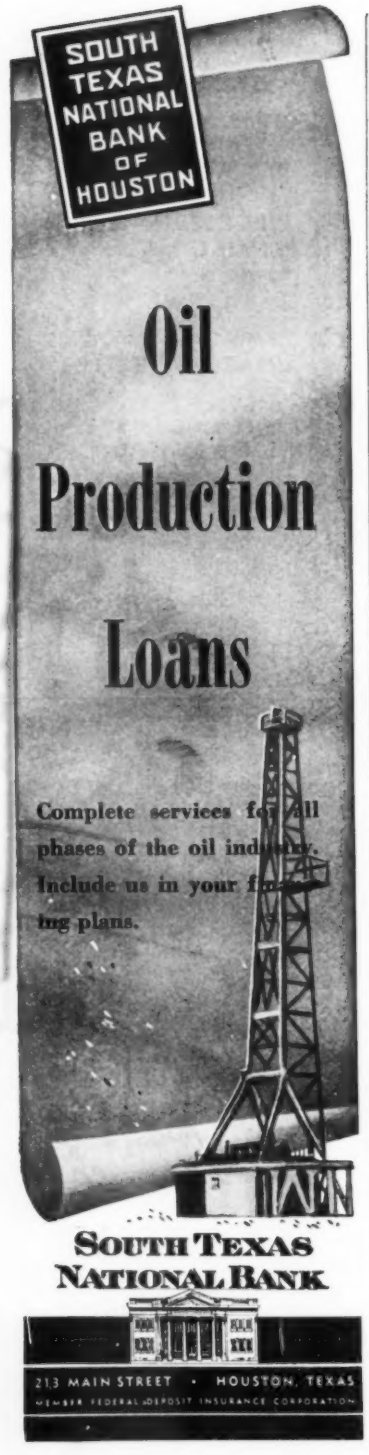
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many millions of dollars' worth of gasoline and chemical plants in this area. In addition to engineering and construction on industrial plants, Brown & Root is a veteran of the oil fields in rig building, site clearing, access roads, drainage, etc. In addition, it is one of the pioneers in the construction of offshore drilling rigs and maintains a fleet of marine vessels for this type of operation.

Personnel. — Headquarters for the United Gas construction job are at Shreveport, where H. G. Twyman is project manager. E. D. Newman is project engineer; K. C. Biedermann, pipe-line superintendent; L. E. Damon, right-of-way superintendent; and W. M. Mahaffey, office manager.

Operations on the Texas Eastern project are conducted from Nashville. F. L. Terry is project manager; Loyd Harleston, pipe-line superintendent; D. E. Warfield, office manager; F. A Ford, project engineer; and Reed Broadway, chief inspector.

General Petroleum's San Ardo Line Now Operating

LOS ANGELES.—General Petroleum Corp. has put into operation its new San Ardo pipe line, and the first tanker load of San Ardo crude oil has been loaded at Estero Bay.

The tanker took over 80,000 bbl. of oil through facilities leased from another company. About 80 per cent was crude oil, the remainder being a light cutter oil which is brought in to be mixed with the heavy, sticky San Ardo crude to make it flow.

The cutter oil is delivered to San Ardo through a small pipe line which parallels the larger one.

The new pipe line was built at a cost of more than $2,000,000. It employs heat as well as the cutter oil to flow the oil. The mixture of cutter oil and crude is heated as high as 175° F. as it is pumped along the 40-mile pipe-line route to the sea. The line makes the full exploitation of the estimated 100,000,000 bbl. of recoverable crude lying beneath San Ardo field economical.

It is currently delivering about 8,000 bbl. daily of the crude oil-cutter-oil mixture to Estero Bay terminal. At full capacity it is believed the line could handle several times this amount.

Materials for the line, both pipe and pumping installations, were obtained by dismantling a 38-year-old idle pipe line in the Mojave Desert.

Lone Star to Lay Outlet

DALLAS.—Lone Star Gas Co. plans to lay 30 miles of 12-in. pipe as another outlet for Bronte gas field of Coke County, West Texas. Lone Star will extend its southern system from Mary Neal, nearest point, to the field. Currently, a cement plant is being served at that point.

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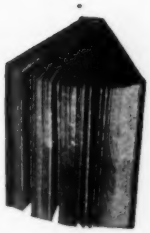

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By DORSEY HAGER

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8. Geological Field Methods and Instruments in Use
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10. Applications of Geology to Drilling for Gas and Oil
11. Geological Factors in Oil-well Drilling
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From a discussion of the origin and accumulation of petroleum, through the problems of producing oil, to the new fields of work for petroleum geologists and geophysicists, this thorough manual provides ready answers to your questions and problems. In it you'll find facts and data on such topics as the chemical composition and properties of oil, the geologic structure in which oil occurs, fossils and their use, a discussion of gas and oil traps, the geological factors to consider in oil well drilling, and the methods of estimating oil recoveries.

Valuable information and reference material on the relationship of water to oil and its effect on oil sands—natural gas and gasoline, including its composition, origin, etc.—and analysis of oil shales is included.

In this edition are a new section on Veatch's Rule, an approximate method of evaluating whole geologic provinces for gas and oil, a map of the U. S. showing deep basins favorable for gas and oil and other helpful features.

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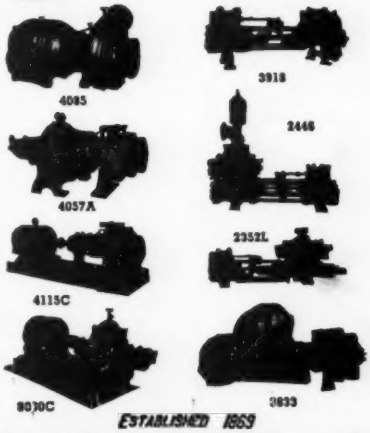

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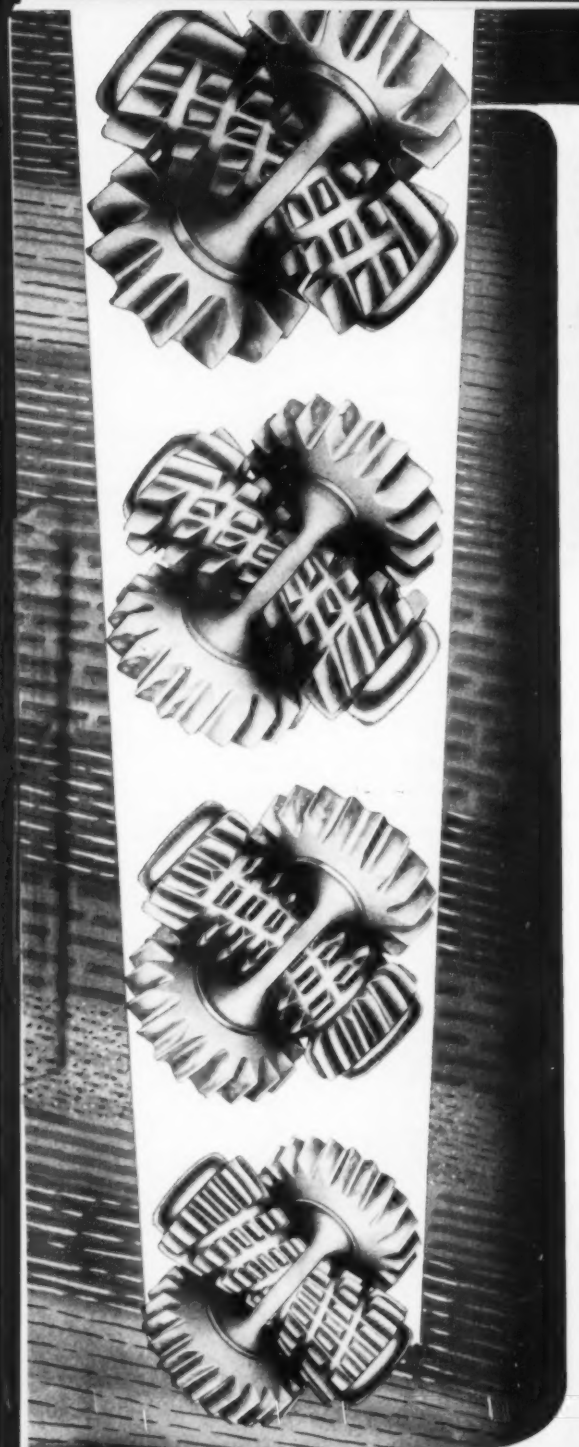

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Among the

Drilling Contractors

Santa Fe Runs 13 Rigs

Santa Fe Drilling Co., Santa Fe Springs, Calif., is keeping 13 rigs busy in various California areas. Of particular interest among its wildcats is a deep test being drilled for Union Oil Co. in the Orcutt area, Coastal California. At latest report hole was below 4,675 ft.

Mitchell Acquires Payne

Ownership of Payne County Drilling Co. has been acquired by Carl Mitchell, for the past 18 years drilling superintendent for Johnson Oil Refining Co., Cleveland, Okla. The company operates cable tools and well cleanout equipment. The company now is on its first contract job with Mitchell as owner. It is located west of Wynona, Osage County.

Wolfe & McGee tools will drill Skelly Oil Co.'s projected Travis Peak test, 1 Chatten, in the B. F. Lynn Survey, 4½ miles east of Jefferson, Marion County, East Texas.

Longhorn Drilling Corp., San Antonio and Three Rivers, Tex., has been awarded contracts for two additional deep wells, one a projected 12,000-ft well for Western Natural Gas Co. on the St. Charles Peninsula, Aransas County, Texas Gulf Coast, and the other an 8,000-ft. well for Sunray Oil Corp. in the North Karon field area, 4½ miles northeast of Oakville, Live Oak County, South Texas. Western Natural Gas Co.'s job is 14 St. Charles Ranch. Location is about 16 miles southeast of Tivoli. Sunray's operation is 2 Dilworth. Objective is the Wilcox sand.

Will I. Lewis Drilling Co., Mount Vernon, Ill., has taken a contract with **Brown Drilling Co.**, Los Angeles, for a Dakota sand test which the latter contractor has projected for its own account in the South Lisco area, Garden County, western Nebraska. Location is in the NW NW SW 30-16n-45w.

Claud M. Bagley, Shreveport, is moving a rig to a location about a mile northwest of the West Big Lake field, Richland Parish, northeastern Louisiana, where he will drill a projected 4,500-ft. test on contract for Caddo Oil Co. Location is for 1 Barham, C NW 28-17n-7e.

Trigg Drilling Co., Oklahoma City, has a rig working for Powell Briscoe on a well just started on the northeast flank of the West Edmond field in Logan County, Oklahoma. The new operation is 1 Ploeger, SE SE NW 27-15n-4w.

Kingery Drilling Co., Ada, Okla., is moving a rig to a wildcat location off the south flank of the Velma pool, Stephens County, Oklahoma, where it will drill for Van Grisso Oil Co. and Glen S. Norville at 1 Hefner, SE NW NE 14-2s-5w. The location is about a

Split crews of Fitzpatrick Drilling Co., Casper, Wyo., drilling for British-American Oil Producing Co. in the Sterling area, northeastern Colorado. Front row, left to right: W. T. Lowery, H. T. Hufford (morning-tour driller); H. L. Parr, and R. P. Umun. Back row: J. R. Kennedy (day-tour driller), and John Mathus.

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mile northwest of the Tussy sand producing area just opened by Van Grisso Oil Co. and Kerr-McGee Oil Industries, Inc.

Dirickson-Lewis Drilling Co., Tulsa, has been awarded the contract for a 4,750-ft. wildcat test to be drilled for Sinclair Oil & Gas Co. in the SW NW NW 9-26n-1e, southern Kay County, Oklahoma. The test is 1 Cromers. Location is about 2 miles northwest of the one-well Southwest Ponca City pool.

Honaker Drilling Co., Great Bend, Kans., has a rig working for Great Lakes Carbon Co. on a rank wildcat location 25 miles west of the Huff-stutter pool, Phillips County, northwestern Kansas. Location is in the SE SE SE 35-1-23, on the Minshall lease.

Rocky Mountain Drilling Co., Los Angeles, has seven rigs working under contract for Shell Oil Co. in the Ventura Avenue field. Of these, four are drilling below 11,000 ft. It has three rigs on Standard Oil Co. of California wells in the Elk Hills field. Three others are drilling for The Texas Co. at Honor Rancho.

Barney Hilburn Drilling Co., Dallas, has a contract with H. L. Hunt to drill a 6,000-ft. test, 1 Yakey, in the Old Glory area of eastern Stonewall County, Texas.

Warren & Bradshaw Drilling Co., Tulsa, has moved a heavy rotary rig to a wildcat location northeast of Stewart, Major County, northwestern Oklahoma, where it has a contract with Sinclair Oil & Gas Co. for a deep wildcat test, 1 Campbell, located in the C NE NW 36-23n-16w. Hole is projected to 9,200 ft.

Justiss-Mears Drilling Co., Jena, La., has contracted with J. S. Michael Co. and Ashland Oil & Refining Co. for a Wilcox test, approximately 4,550 ft., to be drilled about 4 miles west of the Nebo-Hemphill field, LaSalle Parish, northern Louisiana. Location is for 1-N Nebo, C NE SE 19-7n-2e.

ACTIVE ROTARY RIGS*

(United States and Western Canada)

Area—	Week ended 7-9-51	Change week ended 7-2-51	Change week ended 7-10-50
Gulf Coast	563	—27	+ 42
W. Tex.-N. M.	918	+14	+175
Ark.-N. La.-E. Tex.	162	+ 4	+ 18
Oklahoma	288	—12	— 1
Kansas-S. Nebraska	162	+ 4	+ 32
Illinois-Eastern	156	+ 8	+ 16
Rocky Mountains	161	+ 3	+ 58
Pacific Coast	151	— 5	+ 18
Total United States	2,561	—11	+358
Western Canada	141	0	+ 47
Total	2,702	—11	+405

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States and the Pacific Coast and Illinois-Eastern areas are shown on pages 154 and 155.

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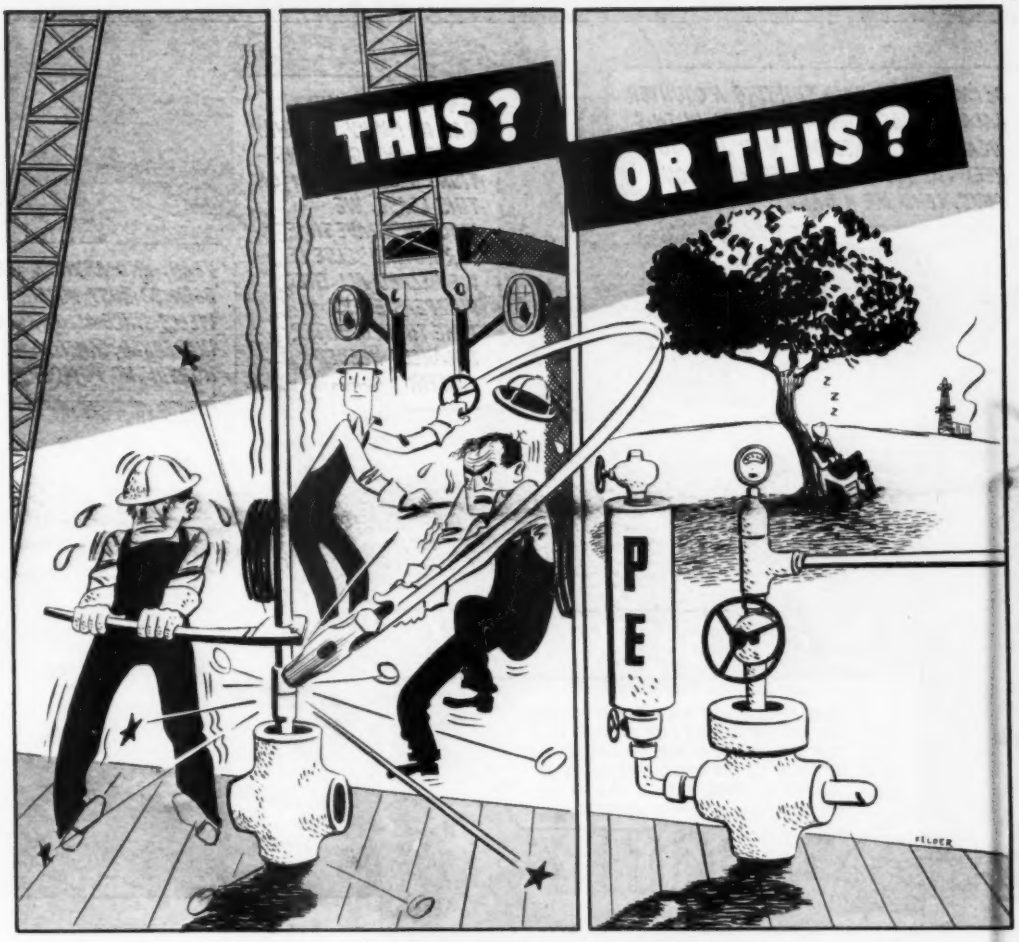

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B	Rapid scale build-up; mild corrosion	PE-21
C	Corrosion only	PE-11
D	Scale only	PE-21
E	H_2S or bacterial corrosion	PE-17
F	Special requirements	PE-(prescribed)

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YEAH, AND ANYHOW WE BEEN SO BUSY PULLIN' WELLS SINCE ALLOWABLES INCREASED, CAN'T BE WET-NURSIN' NO PUMPERS

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NATURAL GAS

Commercial Announces Ammonia-Plant Expansion

STERLINGTON, La. — Commercial Solvents Corp. has announced the synthetic-ammonia plant here will be doubled in capacity by the expenditure of $20,458,000, of which 50 per cent has been certified for accelerated amortization. The new facilities which will also provide for the manufacture of ammonium nitrate, are expected to be in operation by early 1953.

At Sterlington, located in Monroe gas field of North Louisiana, Commercial Solvents now operates a plant with an estimated capacity for converting natural gas to produce approximately 80,000 tons of methanol and 69,000 tons of anhydrous ammonia per year. Although the national capacity for producing synthetic ammonia has increased manyfold since pre-World War II years, demand has again outstripped domestic output, and ammonia and solid - ammonium compounds used as components in fertilizers, are now in short supply.

Expansion of the Sterlington facilities will add further to the production of ammonia from natural gas. Another recent announcement supported the trend when Allied Chemical & Dye Corp. revealed that its two giant plants at Hopewell, Va., and South Point, Ohio, will not only convert from coke to natural gas as a raw material, but also will be expanded in capacity.

When conversions and expansion programs now under way are completed, approximately 75 per cent of synthetic anhydrous ammonia produced in this country will stem from natural gas as a raw material. This fraction, representing about 1½ million tons per year, may be compared with the negligible production of ammonia from natural gas prior to World War II.

Permian Basin Prepares For Pipe-Line Project

Construction of Permian Basin Pipe Line Co.'s 375-mile system is expected to be complete in a 3-month period following Federal Power Commission approval of the project. It is anticipated that the company's line may be completed early in 1952.

The line will extend from Southeast Lea County, New Mexico, to a connection with the Northern Natural Gas Co. system near Skellytown, Tex.

W. D. Gay, president, has his office at 510 Finance Building, Kansas City, Mo. John Fennelly and Hy Gillette, directors, are at Permian Pipe Line Co.'s main office in the Field Building, Chicago. Ray Foudriat, secretary of the corporation, is in charge of the Chicago office.

Contracts for gas have been made for 150,000,000 cu. ft. daily from several producers.

The largest amount of this gas will come from Gulf Oil Corp. Negotiations are being conducted for an additional 150,000,000 cu. ft. to bring scheduled throughput up to 300,000,000 cu. ft. daily. *(The Oil and Gas Journal, July 5, 1951, page 103.)*

Columbia Gas Subsidiaries Seek to Build Facilities

WASHINGTON. — Three subsidiaries of Columbia Gas System, Inc., have filed an application with the Federal Power Commission for construction and retirement of natural-gas-transmission facilities in Pennsylvania, West Virginia, Maryland, and New York.

The firms are Manufacturers Light & Heat Co., Cumberland & Allegheny Gas Co., and Home Gas Co., all of Pittsburgh. Net cost of the entire project is $1,853,063, or $1,052,911 for Manufacturers, $245,152 for Cumberland, and $555,000 for Home.

The projects would improve and increase deliverability of their transmission systems, the companies contend.

Manufacturers is proposing to construct 26 miles of line, retire about 18 miles of line, convert about 3 miles of transmission line into a medium-pressure distribution line, and to retire a 125-hp. compressor station. The facilities to be constructed and retired are located in Fayette, Allegheny, Beaver, Somerset, Adams, Franklin, and Westmoreland counties, Pennsylvania, and Hancock County, West Virginia.

Cumberland is seeking authorization to build 13 miles of line and to retire approximately the same amount in Preston and Barbour counties, West Virginia, and Allegany County, Maryland.

Home asked for authority to construct approximately 16 miles of line, which will parallel an existing line in Steuben and Chemung counties.

Natural Gasoline

DPA O.K.'s Shell Work For Elk City Facilities

WASHINGTON.—The Defense Production Authority last week granted a certificate of necessity to Shell Oil Co. for construction of original facilities for natural-gasoline facilities in Elk City field, Beckham County, Oklahoma, to cost $4,544,000.

Additional compressor capacity will permit return of an additional 60,000 M.c.f. per day to the current rated capacity of 7,500 M.c.f. per day.

Shell will be permitted to take advantage of the accelerated tax-amortization plan, and 70 per cent of the cost of the new facilities can be depreciated for tax purposes over a period of 5 years.

DPA also granted a certificate to Phillips Petroleum Co. covering construction of $241,460 of additional pipe-line facilities near Bartlesville, Okla.; 50 per cent of the cost of the new facilities can be depreciated at the rapid rate.

Sunray Completes Expansion At West Tepetate Plant

LAKE CHARLES, La.—Expansion of processing and compression facilities was completed last week at the West Tepetate gasoline plant of Sunray Oil Corp. increasing throughput from 7,868 M.c.f. per day to nearly 14,000 M.c.f. per day. West Tepetate is now the fourth largest of the 14 Sunray natural-gasoline plants.

Last week, Sunray tied in 1 Joseph Landry as the first of three 8,400-ft. gas-distillate producers on designated units totaling 871.09 acres as permitted under recently granted authorization by the Louisiana Department of Conservation. A 600-hp. compressor has been installed to boost 50 psi. low-pressure flare gas produced from 8,500-ft. oil zone.

Currently, 7,868 M.c.f. per day of gas is being handled through the plant which receives gas-distillate and crude oil from the 8,500-ft. oil reservoir and the 8,800-ft. gas-distillate reservoir; the 9,250-ft. gas-distillate zone is being shut in due to water encroachment.

Plant production is currently 13,000 gal. per day of natural gasoline and 12,000 gal. of L.P.G.

Pure Natural-Gasoline Plant Nears Completion

VAN, Tex.—Rebuilding, repair, and cleaning out work at Pure Oil Co.'s natural-gasoline plant in Van pool of Van Zandt County is expected to be finished soon, company officials have reported. The work will make the facilities among the most modern and up-to-date plants in the country.

Most of the present facilities at the plant are being rebuilt and modernized and all underground pipe lines will be installed overhead. Four new tanks have been added and all separators and old tanks are being rebuilt and repaired. Work was begun 2 months ago.

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Eastern Montana's Paleozoic Tests

SEVERAL of the wildcats staked in eastern Montana shortly after the news broke on Amerada Petroleum Corp.'s discovery of oil in North Dakota are now drilling at depths where anything might happen anytime.

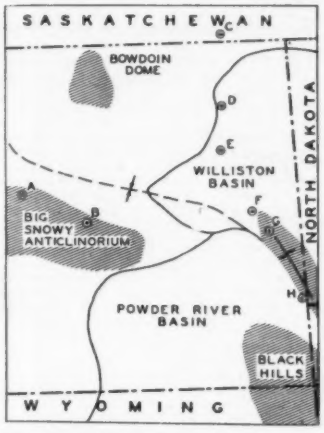
The principal objective of these seismograph-located western Williston basin tests is the Devonian system, which is believed to be similar to that found productive in Amerada's wildcat to the east, but operators are not drilling blindly till the Devonian is topped.

This is real wildcat country. Very little is known about the variable Paleozoics and older Mesozoic rocks of eastern Montana because deep wells are few and far apart and correlations between distant outcrop areas have not yet been thoroughly established. However, based on the limited data available, stratigraphic conditions believed favorable for the accumulation of oil are indicated, not only in the "proven" Devonian, but in the younger rocks as well.

From a wedge edge, perhaps the southern limit of deposition, located not far north of the Black Hills, Devonian sediments thicken northward until they are over 1,000 ft. thick at the international border. Devonian rocks in this area are predominantly nonclastics (limestones and dolomites) but do include some sandstones and shales.

From the base of the Upper Cretaceous to the Devonian many potential reservoirs are indicated for this area. Porous beds of the Jurassic, Triassic, Pennsylvanian, and Mississippian systems, productive to the west in Montana or to the southwest in Wyoming, should be highly promising objectives "on structure" and offer possible stratigraphic traps as they wedge out or change facies across this portion of Montana. A porosity trap in the Pennsylvanian-Tensleep, a prolific producer in several Wyoming fields, appears especially promising.

Practically nothing is known of the Ordovician and Cambrian rocks throughout the major part of this area, but their potentialities cannot be overlooked. Some of the drilling wildcats are scheduled to test at least the upper portion of the Ordovician if nothing is found up the hole.



Deepest test in the area at present is Shell Oil Co. 1 Northern Pacific Railroad, 19-23n-50e, E on map, an 11,000-ft. Ordovician test now drilling tight below 7,920 ft.

At G is another Shell wildcat, the 1 Fee, 30-12n-57e, scheduled 10,000-ft. Devonian test now drilling below 800 ft. This test is located a little east of the surface mapped crest of the Upper Cretaceous gas-producing Cedar Creek anticline and northwest of the apex of the structure where a few deep tests have been drilled in the past.

At F is The Texas Co. 1 N.P.R.R., 35-15n-54e, a projected 9,100-ft. Devonian test.

On the Plevna anticline, a fold paralleling the big Cedar Creek anticline, Texas Pacific Coal & Oil Co. and Pure Oil Co. are drilling 1 Cox, 23-3n-61e, H on map, a projected 10,000-ft. Ordovician test.

D is the location of Carter Oil Co. and Phillips Petroleum Co. West Poplar unit which is scheduled for a Devonian test. A wildcat in this unit at 18-29n-50e was completed dry last year at 5,050 ft. in the Triassic (?)-Chugwater.

Up in Saskatchewan at C, so close to Montana that it should be included in this roundup, is Shell Oil Co. 1 Big Muddy Lake, LSD 15, 12-3-21w2. This wildcat, now drilling below 5,600 ft., is to test the Devonian.

Near what some geologists consider the extreme western limit of the Williston basin, Amerada is drilling two deep tests on the north edge of the Big Snowy anticlinorium. The 1 Pestal at A, 17-28n-24e, is projected to 8,100 ft. It is located 30 miles northwest of the nearest producing oil wells at Cat Creek field. The other wildcat, at B, 1-B N.P.R.R., 1-14n-32e, a 6,500-ft. Madison test now drilling below 700 ft., is 12 miles east of nearest production on the Cat Creek anticline. *Philip C. Ingalls.*

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

SOUTHWEST TEXAS.—Martin, Shelly & Thomas 1 Kate Higgins, Austin chalk crevice discovery in Wilson County, has been potentialed for 328 bbl. of 26.7°-gravity oil daily through 12/64-in. choke. Completion was made from open hole at 5,590-5,632 ft.

ROCKY MOUNTAIN AREA.—Thomas W. Doswell made an important oil discovery in the Tocito (?) sand at South Largo, Rio Arriba County, New Mexico, with the well flowing 32 bbl. of oil per hour for an initial. P. T. Sharples found oil in the Lakota at Southeast Meadow Creek, Wyoming, the sixth Lakota producing pool in this area. Carter Oil Co. and Continental Oil Co. have a joint discovery in the Duchesne area, Utah.

WEST TEXAS.—Spraberry production moved 4 miles east along the Reagan-Glasscock county line as oil started filling the hole at Sohio 1 E. P. Williams in 19-36-T&P, on the Reagan County side. North of Stanton in Martin County, Ryan Consolidated Petroleum Corp. 1 Willie Peters had 2,800 ft. of Spraberry oil on drill-stem test.

Texas Gulf Coast

New Buda Lime Discovery Dead After Big Oil Flow

HOUSTON.—Fayette County's new Buda lime discovery, Sohio Petroleum Co. 1 N. W. Brown Estate, is reported dead after flowing a large volume of 30°-gravity oil through perforations at 7,826-62 ft. Operator is reported preparing to acidize and retest the wildcat. This well established deep production in a heretofore shallow oil area. Location is 5 miles northwest of Flatonia, and approximatly 3½ miles west of production in Southwest Muldroon field.

Shell Oil Co. has completed 3 C. T. Matthew to link Helen Gohlke and West Fordtran Wilcox fields in DeWitt County. Through perforations at 8,164-72 ft., the well flowed at the rate of 240 bbl. of 31°-gravity oil daily through ¼-in. chokes. The new producer is located in W. H. Crain Survey, Abstract 636, 3,458 ft. southeast of 1 Matthew well at Helen Gohlke field in DeWitt County. It is 4,300 ft. northwest of Jergins Oil Co. 2 Ballard well at West Fordtran field in Victoria County. These two fields already have been officially recognized as one reservoir, and the entire field is being referred to as Helen Gohlke. Production is from the Wilcox zone, and the part that has been drilled so far indicates that the main reservoir is uniformly blanketed over the structure.

In Bee County, 4 miles northeast of Beeville, O. Neathery, Jr., et al, 1 C. C. Diebel has been gaged for 43 bbl. of 49°-gravity distillate per day through 6/64-in. choke. This new field opener is producing through perforations at 4,463-64 ft. Tubing pressure was 1,175 psi. and casing pressure 1,675 psi. Discovery is located in Carmen Moline Survey, Abstract 39.

Also in Bee County, approximately 4 miles southeast of Beeville, J. G. Gallaher Drilling Co. 1 G. W. Frels, wildcat, is drilling ahead after recovering oil and gas-cut mud on drill-stem test at 3,492-99 ft. A previous drill-stem test attempt at 2,068-106 ft. had failed. Shaly sand with slight odor was logged at 2,315-60 ft.; sand with gas odor at 3,476-99 ft.; and sidewall samples indicated a sand with oil odor at 2,992-98 ft. The well lies in John Ryan Survey, Abstract 63.

TEXAS GULF COAST (DISTRICTS 2 AND 3) SUCCESSFUL WILDCATS

Fayette County: Oil discovery—Deep Rock Oil Corp. 1 Standard Trust, James Parrott ⅛-Lge., A-258, TD 2,274 ft., perf. Wilcox 2,226-96 ft., IP: 71 bbl. oil per day on pump, 21° gravity.

Goliad County: New pay at Terrell Point—Gasoline Prod. Corp. 3 Stella E. Johnson, Martin Lawler Sur., A-20, TD 4,745 ft., perf. 4,645-49 ft., IP: 126,000,000 cu. ft. of gas per day, open flow.

New pay at Berclair—Scurlock Oil Co. 1 Methodist Episcopal Church, W. P. Miller Sur., TD 3,244 ft., perf. 2,239-42 ft. (Frio), IP: 30 bbl. oil per day on pump, 22.5° gravity.

Victoria County: Gas discovery—Fidelity Oil & Royalty Co. 1 Hulda Horadam, Manuel Zepeda Gr., A-128, TD 4,600 ft., perf. 4,372-76 ft., IP: gas well, no gage; perf. casing 4,326-32 ft.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Brazoria County: John W. Mecom 1 J. H. Craig Estate, John McClosky Lge. 62, dry, TD 7,000 ft.

Goliad County: L. R. Allison 1 Caesar Karnei, J. M. Mancha Sur., A-203, dry, TD 4,517 ft.

Dallas Husky, et al, 1 L. C. Fromme, N. G. Stebbins Sur., A-256, dry, TD 4,856 ft.

Lloyd H. Smith, Inc., 1 R. B. Wells, E. Ferguson & Sol Parks Sur., 6 mi. E-NE of Goliad, dry, TD 4,631 ft.

Jackson County: Hankamer Investment Co. 1 W. H. Clement, Stephen F. Austin Sur., A-5, dry, TD 7,711 ft.

Lavaca County: Horrigan & Fosh 1 Bohumil Vasek, John Morris Sur., A-303, dry, TD 10,385 ft.

Tennessee Production Co. 1 Henry Hamman, H. Dial Sur., A-543, dry, TD 8,518 ft.

Live Oak County: Atlantic Refining Co. 2 J. E. Lyne, AB&M Sur. 139,, A-55, dry, TD 10,621 ft.

R. A. Irwin 1 J. H. Drummond, Juan Conway Sur. 3, A-5, dry, TD 2,716 ft.

Montgomery County: Hassie Hunt Trust 1 H. T. Adriance, et al, Robert Gilbert Sur., A-238, dry, TD 9,020 ft.

North Central Texas

New Caddo Production Is Found Northwest of Woodson

WICHITA FALLS.—New Caddo production has been established 5 miles northwest of Woodson in Throckmorton County, about midway between Woodson and Parrott fields.

Woodson Oil Co. 1 Buchanan, Section 928, completed for a daily potential of 456 bbl. of 41°-gravity oil a day through 28/64-in. tubing choke. Casing perforations were from 4,049-59 ft. Total depth was 4,800 ft.

Warren Oil Corp. has opened two new Caddo fields in Young County. The firm's 1 Marvia Dent, 12 miles southwest of Newcastle, completed for 110 bbl. of oil a day from pay at 3,763-73 ft.

Second discovery, 5 miles southwest of Bryson but in southeastern Young County, was the 1 Orton Bennett, which flowed 51 bbl. of 42°-gravity oil a day through 12/64-in. choke from pay at 3,814-99 ft.

A conglomerate discovery in Wichita County, 8 miles north of Electra, may result in a number of shallow holes in the area being deepened, according to field sources. The new test is Hunter Bros. 1 S. T. Tuttle, Block 180, Waggoner Colony Lands Subdivision. After acid treatment from 5,962-77 ft., the well produced 180 bbl. of new oil in addition to its oil load, then gaged 113 bbl. of 42°-gravity oil in 17 hours flowing through 14/64-in. choke.

In Stephens County, Emil J. Swanson 2 W. E. Carey, previously reported as dry at 2,298 ft., was said to be continuing tests at 2,213 ft. in sand. According to operators, the well made an initial flow of 30 bbl. of oil in 24 hours.

The Texas Co. has staked location for a 6,300-ft. wildcat in Foard County, 2 miles southeast of the town of Margaret. The test is the 1 G. A. Shultz, located on a 160-acre lease in Section 328, H&TC Survey.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) SUCCESSFUL WILDCATS

Archer County: Reno Oil Co. 1 Maxson, ATNCL Sur., 8 mi. S Archer City, TD 1,592 ft., IP pumped 1 bbl. oil.

Callahan County: Mid-Continent Petroleum Corp. 1 A. J. Stevenson, 3-8-SPRR, 6 mi. E Abilene, TD 3,295 ft., elev. 1,831 ft., perf. Palo Pinto 3,27-77 ft., IP pumped 86 bbl. 39°-gravity oil a day, GOR 237 cu. ft.

Cooke County: T. B. Frost 2 E. G. Ramsey, B. Lusk Sur., 8 mi. N Muenster, TD 1,418 ft., IP pumped 65 bbl. 42°-gravity oil a day.

Eastland County: Sturdy Oil Co. 1 Shook & Fox, (was Nathan & Hutchison), McLennan CSL, 7 mi. E Eastland, TD 1,189 ft., IP pumped 5 bbl. oil a day.

Jack County: Fain & McGaha 1 W. E. Maxey, SPRR Sur. 2, 4 mi. SW Antelope, TD 3,636 ft., elev. 1,034 ft., pay 3,620 ft., IP flowed 221 bbl. 42°-gravity oil a day, 18/64-in. choke, TP 410 psi., GOR 460 cu. ft.

Shackelford County: Taxman Oil Co. and D. L. Rose 1 Leech Heirs, Sec. 22, LAL Sur., 9 mi. S Albany, TD 4,401 ft., elev. 1,467 ft., Caddo 4,021 ft., conglomerate pay 4,185-91 ft., IP flowed 80 bbl. 41°-gravity oil a day, 12/64-in. choke, TP 400 psi., GOR 3,200 cu. ft.

Young County: Jack L. Story 1 J. S. Criswell, T. P. Reedar Sur., 6 mi. SE Graham, TD 3,160 ft., elev. 1,071 ft., Strawn sand 3,041 ft., IP pumped 14 bbl. 38°-gravity oil a day.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: W. J. and John J. Moran 6 Hammond, H. Corzine Sur., dry, TD 4,000 ft.

Taxman Oil Co. 1 Skinner, Blk. 20, Harris Club Ranch Subd., dry, TD 1,511 ft.

R. Clay Underwood 1 J. R. Parkey, 1-A419-SPRR, dry, TD 1,827 ft.

Baylor County: Archer Drilling Co. 1 Burrell Mills, 2,414-A465-TE&L, dry, TD 1,421 ft.

Brown County: A. W. Adkisson 2 John Stevens, Sec. 23, HT&B Sur., dry, TD 1,130 ft.

McClain-Roberts 1-E Cox & McInnis, SA-&MG Sur., dry, TD 1,250 ft., elev. 1,553 ft., Capps 544 ft.

Clay County: Bridwell Oil Co. 3 Bridwell River Ranch, Lot 24, Ward & Housell Sur., dry, TD 5,735 ft.

Gubow, Sunshine & Greenspan 2 R. B. Stine, Blk. 34, Parker CSL, dry, TD 1,850 ft.

Cooke County: Field & Field 1 W. H. Campbell, BBB&C Sur., A-1,536, dry, TD 1,614 ft.

R. B. Hollandsworth 1 Bird Moss, Thos. Bell Sur., dry, TD 2,477 ft.

Fred Snuggs 1 Margaret Steed, T. H. Steed Sur., dry, TD 5,520 ft., Simpson 5,060 ft., Ellenburger 5,160 ft.

Eastland County: Pacific Operating Co. 1 Myrtle C. Rogers, Victor Lonza Sur., dry, TD 2,000 ft.

Fisher County: D. E. Hughes 1 H. A. Smith, Sec. 4, SA&MC Sur., dry, TD 3,770 ft.

Foard County: J. A. Green 1 J. S. Ray Estate, 1-A116-GC&SF, dry, TD 3,850 ft.

Jack County: L. T. Burns 2 L. S Wright "C," J. Robbins Sur., A-490, dry, TD 3,966 ft.

Staley Hawkins 1 C. L. Abercrombie, E. Smith Sur., dry, TD 714 ft.

F. Kirk Johnson 1 W. J. Webb, J. F. Middleton Sur., dry, TD 2,970 ft.

R. Benton Ross 1 Lucy Barrick, Blk. 18, J. Robbins Sur., dry, TD 3,975 ft.

Jones County: W. H. Bryant 1 Mrs. S. E. Lawrence, Sec. 8, D&DAL Sur., dry, TD 2,232 ft., elev. 1,545 ft., King 2,148 ft., Swastika 2,185 ft.

Hooker & DeMohrenschildt 1 P. Reynolds, Sec. 3, C&MRR Sur., dry, TD 2,201 ft.

Lester & Duffield, Inc. 1 T. B. Douglas, Lot 47, M. W. Dikes Sur. 218, dry, TD 3,416 ft.

Tal Vez Oil Co. et al 2 L. E. Clyburn, Sec. 27, H. Millard Sur., dry, TD 1,946 ft.

Yeatman Drilling Co. 1 Edgar Boaz, 5-2-T&NO, dry, TD 3,001 ft., Flippen 2,136 ft.

Palo Pinto County: Nat Wissman 2 Shalor Copeland, 2-2-H&GN, dry, TD 1,870 ft.

Stephens County: Fred R. Harrell 2 W. P. Bradford, 66-6-T&P, dry, TD 1,972 ft.

Taylor County: Andree Drilling Co. 1 J. T. Warren, Blk. 123, J. Wm. Pake Sur., dry, TD 3,010 ft., elev. 1,787 ft., Dothan 2,015 ft.

Throckmorton County: Cities Service Oil Co. and Sinclair Oil & Gas Co. 1-80 Swenson Ranch, Sec. 80, BBB&C Sur., dry, TD 5,797 ft., elev. 1,577 ft., Caddo 4,936 ft., Mississippian 5,313 ft., Ellenburger 5,605 ft.

E. J. Muth 1 L. L. Bellah, Sec. 915, TE&L Sur., dry, TD 4,700 ft., Caddo 3,939 ft., Mississippian 4,588 ft.

Wichita County: Fain & McGaha 2 Parker Heirs "D," Blk. 2, M. Ramsey Sur., dry, TD 4,212 ft.

W. H. Hammon 1-D Fassett & Tuttle, Day Land & Cattle Co. Sur., dry, TD 2,993 ft.

Wilbarger County: F. J. Pounds 1-B Pounds-Waggoner, 29-4-H&TC, dry, TD 2,467 ft.

Wilder & Underwood 2-D Waggoner, 10-13-H&TC, dry, TD 1,935 ft.

Wise County: Akin & Dimock 1 J. P. Mann, Marshall University Sur., A-548, dry, TD 6,015 ft.

Young County: R. O. Coe 1-A Pace & Strange, A. Rohus Sur., dry, TD 778 ft.

Hornung & Harris 1 A. C. Spear, Stoneman Sur., A-250, dry, TD 4,631 ft., Caddo 4,312 ft.

Baash-Ross News

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OUR 31st YEAR

Hex Kellys Give the Most in PERFORMANCE FEATURES

..and BAASH-ROSS GIVES THE MOST IN HEX KELLYS!

The Hexagon Kelly has become firmly established among performance-minded oil men as the *best* all-around kelly for modern drilling operations. It is not only easier to keep straight, is stronger, has greater circulation area, and incorporates many other important features (as highlighted at right) . . . but, in addition, it can be used for *both* regular and pressure drilling operations without change. This added feature greatly simplifies equipment inventories and also saves vital time when pressure emergencies occur — both advantages of utmost importance!

And Baash-Ross is the organization that, from the very beginning, has consistently led in the development of the Hexagon Kelly . . . in the development of better metallurgical and heat treating processes for incorporating the best *balance* of physical properties into Baash-Ross Hexagon Kellys . . . in the development of better machining techniques to assure a straighter bore, better joint alignment, more uniform wall thickness and other advantages in *Baash-Ross* Hexagon Kellys.

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These are the NATURAL ADVANTAGES of Hexagon Kellys . . .

- **SMOOTHER RUNNING** — because they are *machined* — not forged — to shape, hence have closer tolerances, better balance!
- **GREATER RESISTANCE TO BENDING** — because even across their weaker axis they are 17½% more resistant to bending than the comparable size square kelly across its stronger axis!
- **36% MORE CIRCULATION AREA** — because of greater cross-sectional area. Particularly vital with today's full-hole pipe and high-volume pumps!
- **24% STRONGER IN TORQUE** — because of their shape and greater cross-section. Doubly important with today's longer strings, higher rotational speeds!
- **GREATER TENSIONAL STRENGTH** — because of more cross-section. A valuable feature with today's heavier strings!
- **MAXIMUM ADAPTABILITY** — because they can be used for both regular and pressure drilling without change. Simplifies inventories, saves vital time in pressure emergencies!

These are the ADDED ADVANTAGES You Get in BAASH-ROSS Hexagon Kellys!

- **BEST BALANCE** of shock-resisting toughness and wear-resisting *hardness* resulting from the exclusive Baash-Ross method of subjecting specially-selected alloy steels to multiple *full-length* heat-treatments that develop the metallurgical properties of the steel for both hardness and toughness.
- **UNUSUALLY ACCURATE BORE**, exactly centered end-to-end and then individually checked by special survey equipment.
- **PRECISE JOINT ALIGNMENT**, double-checked by the Baash-Ross Alignascope, assures concentric rotation and freedom from joint failures.
- **PLUS EQUALLY RIGID CHECKS** on overall straightness . . . on thread form, taper, lead and finish . . . on dimensional accuracy of drive faces, upsets, etc. . . . checks that meet all API specifications as well as extremely close Baash-Ross specifications.

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Not only does this Bushing provide all the well-known advantages of Baash-Ross Roller Kelly Bushings . . . instant friction-free response to bit feed, better control of weight, more footage per bit, longer equipment life and higher all-around drilling efficiencies . . . *but it also permits quick adjustment to provide the close fit so essential for maximum Hex Kelly performance.*

The narrower driving faces on Hex Kellys make it vitally important that a close fit be maintained between the Bushing and Kelly at all times.

In the Baash-Ross Kelly Bushing this adjustment is readily made by simply adding or removing Adjusting Shims in the body. Each set of Shims added or removed changes the working diameter by exactly 1/32", making close adjustment a quick, simple operation. (See page 416 of your 1950 Composite Catalog for further details on this vital adjustment feature!)

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Southwest Texas

New Wilson County Test Makes 328 Bbl. 26.7° Oil

CORPUS CHRISTI — Martin, Shelly & Thomas have gaged 1 Kate Higgins, new Wilson County Austin chalk crevice discovery, for 328 bbl. of 26.7°-gravity oil daily through a 12/64-in. choke. Tubing pressure was 895 psi. and casing pressure 900 psi. Operators hit a crevice in chalk at about 5,620 ft. and stuck drill pipe. After recovering pipe, drill-stem test was conducted at 5,591-632 ft., open 20 minutes, using ¼-in. top and bottom chokes. The well flowed oil in 19½ minutes. Electric log was run to 5,609 ft. and 5½-in. casing set to 5,590 ft. for open-hole completion at 5,590-632 ft. from the crevice.

H. R. Smith, et al, 1 C. Martin Estate, deep Buda lime discovery on the east flank of Dillworth salt dome, is standing while operators check on fluid level. The well was acidized at 8,380-96 ft. in Buda lime, and at the end of a 12-hour test, the well made 11 per cent acid water and 89 per cent oil through ⅜-in. choke. Tubing pressure was 150 psi. This well is bottomed at 9,809 ft. in salt plug topped at 9,774 ft. The operators will move in swabbing unit to resume testing.

In Nueces County, Panhandle Producing & Refining Co. has completed 1 Knolle farms, wildcat gas discovery 10 miles north of Auga Dulce, for 53,000,000 cu. ft. of gas per day on open flow. The well also produced 1 bbl. of condensate per million cubic feet of gas. This discovery is located in Share 9, Bluntzer Partition, approximately 3 miles north-northeast of Farenthold field.

Four and one-quarter miles east of Hoffman Extension field, Duval County, Magnolia Petroleum Co. 2 Sinclair Heirs has been completed for 28,500,000 cu. ft. of gas daily through perforations at 2,165-69 ft. The wildcat was drilled to 3,264 ft. and set 6⅝-in. casing at 2,210 ft. It is located in AB&M Survey 499, A-45.

Two miles northwest of Bishop, in Nueces County, Eastern States Petroleum Co., Inc., 1 H. A. Pearson, F. Z. Bishop Subdivision of Well Ranch, is testing through perforations at 7,211-14 ft. Well is bottomed at 7,808 ft. with 5½-in. casing set to 7,338 ft. This well is ½ mile southeast of the West Bishop gas production which is from the 7,150-ft. level.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) SUCCESSFUL WILDCATS

Duval County: Gas discovery—Hawn Bros., et al, 1 Lula W. Pursch, BS&F Sur. 115, 14 mi. NE of Freer, TD 2,550 ft., perf. 2,499-501 ft., IP: 2,050,000 cu. ft. of gas daily, open flow.

Starr County: Gas-condensate discovery—The Chicago Corp. A-2 State-Slick, J. C. McCarty Sur. 885, TD 5,911 ft., perf. 4,342-51 ft., IP: 14,500,000 cu. ft. of gas daily plus ungaged amount of 61.3°-gravity distillate.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Bastrop County: G. C. Schoonmaker 1 J. T. King, Enoch Harris Sur. 22, A-189, dry, TD 2,952 ft.

Edwards County: J. A. Humphrey & J. C. Wynn 1 Joe Sid Peterson, HE&WT RR Co., Sur. 69, A-353, dry, TD 6,517 ft.

Frio County: Sid Katz 1 E. B. Simmons, R. D. Horton Sur. 20, A-1370, dry, TD 6,320 ft.

Martin, Shelly & Thomas 2 Leo Newsom, P. F. Morales Sur. 1414, A-497, dry, TD 4,285 ft.

McMullen County: Newman Bros. Drilling Co. and Alaska Steamship Co. 1 H. M. Roark, BS&F Sur. 59, A-149, dry, TD 4,660 ft.

Webb County: Louis H. Haring, Jr., Kirkwood & Co. and Hawn Bros. 1 Jesus & Juan Vela Cuellar, Share 4 of Cuellar Gr., 2 mi. NW of Bruni, dry, TD 6,215 ft.

California

Expanded Wildcat Campaign Begins Paying Dividends

LOS ANGELES.—The expanded wildcatting campaign undertaken by California operators in recent weeks was paying dividends last week.

In the Del Valle-Castaic Junction area of Los Angeles County a new 9,000-ft. field was added, and in Kern County's Salt Creek area a new shallow-oil discovery was registered. Two other oil discoveries seemed assured, one in the Arvin area of Kern and the other south of Pyramid Hills in Kings County. In addition San Ardo field of Coastal California was given a ¾-mile northeast extension.

The successful Los Angeles County wildcat was Southern California Petroleum Corp. 1 Newhall Land & Farming Co., located about ½ mile south of Del Valle production and 1¼ miles northwest of Newhall-Potrero field. Drilled to 9,022 ft., where 7-in. casing was set, it was completed flowing about 115 bbl. daily (cut 25 per cent) of 35°-gravity crude. Production was obtained in an upper Miocene sand through perforations at 8,890-8,962 ft.

Slightly over 1 mile southwest of the Salt Creek field, in SW SW 19-29s-21e, Ferguson & Bosworth completed 2 Anderson as a 30-bbl. pumper in the Phacoides zone, lower Miocene. Topping the Phacoides at 453 ft., hole was bottomed at 496 ft.

The two prospective discoveries were Norris Oil Co. 115-28 "Well," 1½ miles southeast of Pyramid Hills, near the Kern-King County line; and The Texas Co. 1 George, about 1 mile east of the southern end of Mountain View field in Kern County. At the former, pumping equipment was being installed after 40 to 60 bbl. of 13°-gravity crude was bailed from the 893-ft. hole. Production was being obtained from an upper Temblor sand, topped at 856 ft., through perforations at 852-92 ft.

The Texas Co.'s potential Arvin discovery at last reports was coring ahead below 6,513 ft. Previously, however, a formation test at 6,360-6,424 ft. resulted in the recovery of 700 ft. of oil after the tool had been open 1 hour. That the wildcat, which is located in NE NW 23-31s-29e, was expected to open a new field was evidenced by spirited leasing activity in the immediate vicinity.

Northwest of Thornton gas field in Sacramento Valley, 15-15n-4e, The Texas Co. was attempting to open a new gas area with its 1 Vorden. Drilled to 4,775 ft., testing was under way in the Capay sand topped at 4,226 ft. On a formation test at 4,264-74 ft. the sand tested wet. Later four holes were perforated at 3,797 ft. in preparation for making a second test.

In Cuyama Valley the deepest hole drilled to date has been abandoned. The wildcat was Richfield Oil Corp. C-2 Russell in 10-10n-26w. It had been carried to a depth of 12,981 ft. without success. Another eastern Cuyama wildcat abandoned was Honolulu Oil Corp. 55 Honolulu-Humble-Dougherty. Located in 13-9n-26w, it failed to find production in the Painted Rocks and Colgrove sands and was abandoned in the Cretaceous at 6,502 ft.

About 1 mile northeast of the town of Montecello in Napa County, northern California, a wildcat seeking production in Cretaceous pays has been staked by Western Gulf Oil Co. Scheduled to drill to about 10,000 ft., the 1 J. N. Knowles is about 6 miles north of a 6,000-ft. test drilled last year. Western Gulf holds a block of about 90,000 acres in the area.

CALIFORNIA SUCCESSFUL WILDCATS

Kern County, Salt Creek area, new field discovery: Ferguson & Bosworth 2 Anderson, SW SW 19-29s-21e, pumped 30 bbl. daily (cut 30 per cent) through 45 ft. of perforations above 496 ft., 21.7°-gravity crude, Phacoides 453 ft., TD 496 ft., elev. unreported.

Los Angeles County, Del Valle-Castaic area,

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new field discovery: Southern California Petroleum Corp. 1 Newhall Land & Farming Co., NW SE 20-4n-17w, flowed 130 bbl. daily cut 30 per cent, 35°-gravity crude, through perforations at 8,890-8,962 ft., TD 9,022 ft., elev. 1,000 ft.

Monterey County, San Ardo field, ¾-mile northeast extension: Superior Oil Co. 6 Orradre, NE SE 6-23s-11e, pumped 75 bbl. daily cut 65 per cent from perforations at 2,730-84 ft., Lombard 2,315 ft., Orradre 2,729 ft., basement 2,812 ft., TD 2,821 ft., plugged back to 2,789 ft., elev. 981 ft.

CALIFORNIA UNSUCCESSFUL WILDCATS

Fresno County, Coalinga area: Lange Oil Co. of Texas 13 "Well," 12-21s-14e, dry, TD 639 ft., elev. 1,150 ft.

Kern County, Fruitvale area: Five Star Drive-In Theater, Inc., 1 Gannon, 2-30s-27e, dry, TD 4,436 ft., elev. 390 ft.

Los Angeles County, Canoga Park area: Southern California Petroleum Corp. 1 Escorpion, 2-1n-17w, dry, TD 3,476 ft., elev. 890 ft.

San Fernando-Aliso area: Standard Oil Co. of Calif. 1 Foothills-Orchards, 1-2n-16w, dry, TD 5,114 ft., elev. 1,090 ft.

San Luis Obispo County, southeastern Cuyama Valley area: Richfield Oil Corp. C-2 Russell, 10-10n-26w, dry, TD 12,981 ft., elev. 2,136 ft.

Morales Canyon area: The Texas Co. 1 Harrington, 14-11n-28w, dry, bottomed in Cretaceous, TD 2,790 ft., elev. 2,342 ft.

Santa Barbara County, South Cuyama outpost: Richfield Oil Corp. 13-26 Heller, 26-10n-27w, dry, TD 5,891 ft., elev. 2,560 ft.

Southern Cuyama Valley area: Honolulu Oil Corp. 55 Honolulu-Humble-Dougherty, 13-9n-26w, dry, Relizian shale 4,483 ft., Painted Rocks 4,823 ft., Colgrove sand 5,824 ft., Cretaceous 6,068 ft., TD 6,502 ft., elev. 3,065 ft.

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Michigan

Newaygo County Wildcat Is Completed for 50 Bbl.

MOUNT PLEASANT. — Augie Busk's 1 Hatchew et al, SE SW NW 29-12n-11w, Croton Township wildcat in Newaygo County, was completed in Traverse at 2,553 ft., total depth, and rated good for 50 bbl. of oil and 20 bbl. of water a day after acid treatment with 1,000 gal. This is the newest Traverse oil discovery well in Michigan. Top of the Traverse lime was logged at 2,548 ft. and oil pay, which showed 650 ft. of free oil, natural, in 4 hours with no water, was logged at total depth. Water started to show after the acid treatment. Busk and Sun Oil Co. are the major acreage holders in this new play, but neither has announced a follow-up drilling program in Croton Township this week as a result of the discovery.

The Gibson Township, Bay County potential Dundee wildcat discovery at J. O. Mutch 1 Demaray, SW SE SW 20-8n-3e, was scheduled to be reacidized in the Dundee with 2,000 gal. this week after well showed for only 5 to 6 bbl. of oil a day after initial treatment with 1,000 gal. Dundee top was logged at 2,997 ft. Oil pays were drilled at 3,090-3,120 ft. and hole showed 100 ft. of free oil overnight after plug was drilled from 5-in. casing. Hole is bottomed out at 3,157 ft.

Mutch also logged a lower Traverse oil pay in a Sterling field well, Deep River Township, Arenac County, this week. This was reported to be the first lower Traverse pay found in Sterling pool, although other wells are being produced from both the upper Traverse and the Dundee.

The lower Traverse pay was logged at Mutch's 1 Ort, NE NW NE 20-19n-4e, from 2,100-05 ft. and was reported to be good for 15 bbl. a day, natural. Tests were in progress this week after pay had been acidized with 500 gal. Top of Traverse was logged at 1,974 ft. and an upper pay, logged at 1,995 ft., was tested out as noncommercial.

MICHIGAN SUCCESSFUL WILDCAT

Newaygo County, Croton Township: Augie Busk 1 Hatchew et al, SE SW NW 29-12n-11w, Traverse 2,548 ft., 50 bbl. oil and 20 bbl. of water after 1,000 gal. acid, TD 2,553 ft.

MICHIGAN WILDCAT FAILURES

Allegan County, Watson Township: R. H. Butterfield 1 Klamer, NE NW SE 3-2n-12w, Traverse 1,782 ft., dry, TD 1,792 ft.

Sheldon-Stewart Co. 2 Overton, NE NW NW 18-2n-12w, Traverse 1,493 ft., dry, TD 1,531 ft.

Max Spidel 1 Miller, SE NW SE 19-2n-12w, Traverse 1,491 ft., dry, TD 1,518 ft.

Barry County, Assyria Township: Max Spidel 1 Holmes, NW SW NW 19-1n-7w, Traverse 1,789 ft., dry, TD 1,836 ft.

Oceana County, Otto Township: Turner Petroleum Corp. 1 Peter, et al, SW SW NW -9-13n-16w, dry in Coldwater lime, TD 785 ft.

Roscommon County, Roscommon Township: Taggart Bros. Gas Co. 1 Hilliard-Amercrude Oil Co.-Stoll, NW 28-22n-4w, Stray 1,161 ft., dry, TD 1,171 ft.

Kansas

Cheyenne County Wildcat Retesting Marmaton Zone

TESTING has been resumed in Ben F. Brack's prospective discovery well in Cheyenne County, in the northwest corner of the state on the eastern flank of the Denver-Julesburg basin. After cementing off casing perforations at 4,145-49 ft. in the Lansing, where it had some trouble with water channeling around the casing, the well has been reperforated in the Marmaton zone at 4,495-4,505 ft. and at latest report was pumping 3 bbl. of oil per hour. A trace of water was showing.

The well is 1 Judy, SE SE SW 26-1-39. Location is 4 miles south of the Nebraska line and 20 miles east of the Colorado line. Production is the first from the Pennsylvanian for the basin, and the first of any kind for the Kansas portion of the basin. Fields so far discovered in the Nebraska and Colorado portions of the basin produce from the Dakota series.

Previously tested at 4,480-96 ft. in the Marmaton, the well swabbed at the rate of 60 to 80 bbl. of 38° oil per day. Following that test, a plug was set and casing perforated in the Lansing, from which the well sprayed gas over the derrick and then swabbed at the rate of 3 bbl. of oil per hour before channeling developed.

Another rank wildcat in Ness County, in western Kansas, has found promising oil and gas showings, both in the Marmaton zone (Pennsylvanian) and the Mississippian. It is Flynn Oil Co. 1 Petersville, SW SW SW 11-20-24. Nearest production is in the Manteno pool, also in Ness County.

A drill-stem test of the Marmaton at 4,327-52 ft. with tester open 1 hour yielded 85 ft. of oil-cut mud and 2,250 ft. of gas. Mississippian was topped at 4,434 ft. An interval at 4,437-47 ft. was tested, yielding 24 ft. of free oil and 81 ft. of mud-cut oil with 75 ft. of gas. Casing has been set to the top of the latter interval.

Atlantic Refining Co. 1 Sankey, NW NW NW 22-22-10, northwestern Reno County, and 4 miles northwest of nearest production in the Zenith-Peace Creek pool, was swabbing at the rate of 16 bbl. of fluid, 25 per cent water, per hour at lastest report. Production is from the Lansing-Kansas City with casing perforated at 3,187-95 ft. and pay zone acidized with 4,000 gal. Hole had been drilled to the Arbuckle, topped at 3,630 ft. and drilled to 3,669 ft. without indications of commercial production.

In southern Graham County, 2½ miles southwest of the Smith-Donning pool, Jones, Shelburne & Farmer 1 Teall, SE SE NW 18-10-21, got 420 ft. of oil in a drill-stem test (open 15 minutes) at 3,914-21 ft. in Arbuckle lime, cut at 3,909 ft. Casing has been run to 3,911 ft.

Operations in many parts of Kansas were shut down or hampered by flood conditions, which closed many roads.

KANSAS SUCCESSFUL WILDCATS

Saline County: El Dorado 1 Olsson, NW NW SW 1-16s-4w, 528 bbl. oil from Maquoketa dolomite at 3,422-27 ft., TD; zone discovery in Ryding.

Northwestern Drillers 1 Faith, CSL N/2 NW 19-14s-2w, pumped 40 bbl. oil from Viola at 3,206-09 ft., TD; zone discovery in Salina.

KANSAS WILDCAT FAILURES

Butler County: Birmingham & Bartlett 1 Frerking, SW SW SE 4-24s-4e, dry, TD 2,930 ft.

Graham County: Fred-GMR 1 Lasley, SE SE NW 16-10s-22w, dry, TD 4,045 ft.

Greenwood County: Davis-Ives 1 Black SE SE NW 4-27s-13e, dry, TD 1,430 ft.

Morris County: Holl et al 1 West, SW SW NE 6-17s-5e, dry, TD 2,500 ft.

Pottawatomie County: Skelly 1 St. Mary's College, NE SW NE 11-10s-12e, dry, TD 3,300 ft.

Reno County: Mid-Continent-Barnett 1 Starr, SE SE NW 7-22s-10w, dry, TD 3,618 ft.

Lindas 1 Smith-Taylor, SW SW NW 18-22s-10w, dry, TD 3,605 ft.

El Dorado 1 Theis, NE SE NE 31-26s-4w, dry, TD 4,180 ft.

Rooks County: National Co-Op 1 Petersen, SW SE SE 23-8s-19w, dry, TD 3,480 ft.

Saline County: Northwestern Drillers 1 Anderson, NW NW NE 7-16s-3w, dry, TD 3,500 ft.

Stafford County: Francis Oil & Gas 1 Heitz, 29-22s-12w, dry, TD 3,785 ft.

Lockhart 1 Thole, NE SE SW 14-23s-12w, dry, TD 3,885 ft.

Sutton 1 Basore (Bentley), NE NE SW 14-25s-12w, dry, TD 4,135 ft.

CENTRAL NEBRASKA WILDCAT FAILURE

Red Willow County: Superior 72-36 State, SW NE NE 36-2n-29w, dry, TD 3,955 ft., strat test.

Eastern Texas

Sub-Clarksville Wells Show in Wood County

DALLAS. — Wood County had one sub-Clarksville discovery in the completion stage and another listed as probable, the latter being drilled ahead to the Woodbine before starting tests of the upper formation.

Watson W. Wise 1 Lillian Moseley, W. H. Secrest Survey, completed on the pump as a sub-Clarksville discovery, making 67 bbl. of oil a day from pay at 4,554-70 ft. Location is between the Forest Hill and Midway Lake fields.

West of the Pine Mills field, A. O. Phil-

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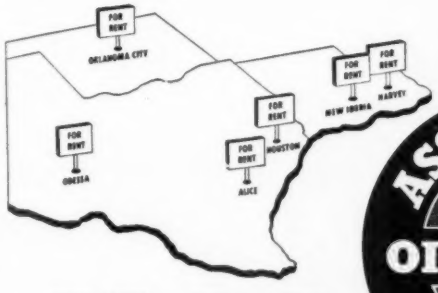

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lips 1 D. E. Dobbs was drilling ahead at 5,860 ft. and was expected to reach the Woodbine shortly. The well had previously topped the sub-Clarksville at 5,545 ft., then cored 30 ft. of sand with oil shows between 5,548-95 ft.

Hollandsworth Oil Co. has staked location for its 1 Kilpatrick-Fouke 8 miles west and north of Hawkins in Wood County. Projected depth was 6,500 ft.

B. B. Orr has staked location for a Woodbine, or 6,000-ft., test 10 miles northeast of Quitman as the 1 Mrs. E. M. Dashiel. Location is on a 320-acre tract in the W. P. Kingennon Survey.

George Humphrey 1 Barnes Heirs was drilling shale at 8,830 ft.

EAST TEXAS (DISTRICTS 5 AND 6) WILDCAT FAILURES

Falls County: New & Coker 1 J. Tetterman, M. Hunt Sur., dry, TD 1,518 ft., Buda 1,212 ft., Georgetown 1,310 ft.

C. B. Simmons 1 Romert Simmons, G. W. Harbour Sur., dry, TD 1,397 ft., Buda 1,080 ft.

Hunt County: S. G. Harper 1 V. T. Banks, J. W. Haynes Sur., dry, TD 1,960 ft.

South Louisiana

New Gas-Condensate Pay Found in Jennings Field

NEW ORLEANS.—New deep gas-condensate pay has been established in Jennings field, Acadia Parish, at Bates & Cornell 1 J. Trushel Estate, 42-9s-2w. Through perforations at 8,830-60 ft., the well flowed 92 bbl. of 53° gravity distillate through a 12/64-in. choke.

In Orleans Parish, The Texas Co. is swabbing its wildcat, 1 State-Lake Borgne, after acidizing perforations at 8,330-40 ft. with 2,000 gal. of acid. Prior to acid treatment, tubing was set on packer at 8,257 ft. and well was opened on a 9/64-in. choke. There was no flow and no rise in fluid was noted after swabbing. Tests will be made of persorations at 8,290-8,320 ft. On a previous test through casing perforations at 8,360-70 ft., the well flowed 1,723,000 cu. ft. of gas per day through 9/64-in. choke. Tubing pressure was recorded at 2,850 ft. This wildcat is bottomed at 13,270 ft. with 9⅝-in. casing cemented at 10,877 ft. Operator plugged back to 9,225 ft. for testing.

Meanwhile, The Texas Co. 1 State-Blind Bay, Plaquemines Parish wildcat, tested salt water from perforations at 13,288-95 ft. and operator squeezed to reperforate at 12,896-98 ft. Hole is bottomed at 14,300 ft. with 7-in. pipe cemented at 13,970 ft. and plugged back to 13,380 ft.

Sinclair Oil & Gas Co. is coring below 11,258 ft. at its Avoyelles Parish wildcat, 1 Turner Lumber Co., 20-2s-6e, 1 mile west of Woodside. Recovery of cores from 7,727-8,929 and 10,084-125 ft. indicated no shows. The wildcat has a projected depth of 13,000 ft.

Lake Fortuna in St. Bernard Parish received another wildcat at Estate of William Helis 1 State Lease 1828, 21-16s-17e. The well was abandoned at total depth of 10,493 ft. after running electric log to bottom which indicated no shows.

This is the second failure in 3 weeks for Lake Fortuna. Gulf Refining Co. plugged 1 State Lease 1830 at total depth of 10,498 ft. after attempts to free stuck drill pipe were unsuccessful.

SOUTH LOUISIANA WILDCAT FAILURES

Pointe Coupee Parish: Sinclair Oil & Gas Co. 1 S. N. Garrett, et al, Torbert area, 30-6s-10e, dry, TD 11,003 ft.

St. Barnard Parish: Gulf Refining Co. 1 State Lease 1830, Twp. 16s-17e, Black Bay area, dry, TD 10,498 ft.

Rocky Mountain

San Juan Basin Discovery Flows Oil at High Rate

DENVER.—An outstanding oil discovery was made this week on the east side of the San Juan basin with the well flowing 32 bbl. of oil per hour on initial gage.

The well is Thomas W. Doswell 2 Scott-Federal, C NW SE 9-26n-6w, in the South Largo area, Rio Arriba County, New Mexico. This is Doswell's third well in the general area, with the other two deeper failures than the present test.

On drill-stem test at 6,605-6,700 ft. the well flowed 20 bbl. of oil in 25 minutes. The zone is tentatively identified as the Tocito sand, in the Mancos formation. However, some geologists believe the zone is above the Tocito, as identified further westward in the basin.

The operator is continuing to test at the well. This is the first discovery of oil in this general area of the basin, and the first oil from this zone in the Mancos. The discovery is considered of sizable importance for future drilling in this area of the basin, where heretofore gas production from the Pictured Cliffs and Point Lookout formations has been found. Production throughout the gas area of the basin has moved considerable eastward during the past 2 years, but no oil production had been found previously in the zone where Doswell is now testing.

Another discovery for the Sussex-Meadow Creek area is apparent following tests by P. T. Sharples, head of Sharples Oil Corp., in the Southeast Meadow Creek area. The well is 1-A-19 Government, NE SE NW 19-41n-77w, 2 miles southeast of production in the field proper. The well flowed oil in 70 minutes on drill-stem test of the Lakota

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sand between 7,692-7,741 ft. Top of Lakota was logged at 7,688 ft. and the top of the formation had shows of gas, with the bottom 20 ft. saturated. Sharples is running casing for completion of the well. There are now six Lakota sand producing pools in the Sussex-Meadow Creek area.

The fourth basal Green River fractured shale discovery in the Uinta basin of Utah is being completed by Carter Oil Co. and Continental Oil Co. at Duchesne, Utah. The well is 1 Ute Tribal, C SE NE 17-4s-4w, 35 miles southwest of Roosevelt field. It flowed 20 bbl. of fluid with some drilling fluid cut, in 3 hours. The operator is continuing to clean up the well prior to an official completion gage. The producing zone is between 7,486-7,596 ft. This well caught fire and the rig was burned when the zone was tested, prior to running casing.

WYOMING WILDCAT FAILURE

Fish Creek, Natrona County: Atlantic Refining Co. 2 Government, SW NE NE 8-31n-84w, TD 1,266 ft., dry, Cloverly 970 ft., Lakota 993 ft., Morrison 1,034 ft., Sundance 1,207 ft.

COLORADO WILDCAT FAILURES

Greenwalt Block, Logan County: British-American Oil Producing Co. 1 L. F. Ramey, NE SW SW 2-9n-52w, TD 5,015 ft., dry, D sand 4,595 ft., J sand 4,716 ft.

Pruett area, Logan County: Fisher and Stout 1 State, NW NW SE 36-6n-54w, TD 4,797 ft., dry, Muddy 4,602 ft., Dakota 4,718 ft.

Akron area, Washington County: J. M. Huber Corp. 1 Cartwright-Strong, NW NW SW 24-3n-53w, TD 5,243 ft., dry, Niobrara 3,948 ft., Timpas 4,291 ft., D sand 4,753 ft., J sand 4,824 ft., Lakota (M) 5,058 ft., Morrison 5,164 ft.

MONTANA WILDCAT FAILURE

Pike Creek, Fergus County: J. E. McKenna 1-A Schaff NW SE SW 33-13n-24e, TD 804 ft., completed as a water well. Coal 508 ft., Morrison 524 ft., Ellis 714 ft.

WESTERN NEBRASKA WILDCAT FAILURE

West Huntsman, Cheyenne County: B. B. Carter Drilling Co. 2 Lohr, NE SE SE 7-14n-50w, TD 5,030 ft., dry. Niobrara 3,997 ft., Ft. Hays 4,277 ft., Codell 4,364 ft., Carlile 4,371 ft., Greenhorn 5,430 ft., first sand 4,782 ft., second sand 4,835 ft., Muddy 4,937 ft., Skull Creek 5,005 ft.

NORTH DAKOTA WILDCAT FAILURE

Cavalier County: Union et al 1 Skjervheim, C NW NW NW 28-159n-63w, dry, TD 3,408 ft., tight hole.

Appalachian-Ohio

Great Activity Continues In Maryland Gas Area

PITTSBURGH.—Activity in Garrett County, Maryland, continues at a high pace. There was a good gas well brought in, and 3 new locations brought the total number of active and planned ventures to 33. Fox & Trimble completed 1 Myrtle McGee, gaging 4,500,000 cu. ft. of gas (see wildcat paragraphs following). Eberly & Johnson 1 William White, elevation 2,412 ft., is drilling at 3,748 ft. after topping the chert at 3,627 ft. and finding 134,000 cu. ft. of gas at 3,647-74 ft. Eberly & Snee 1 Otis Shaham, elevation 2,459 ft., resumed operations and is drilling ahead at 3,531 ft. The Shaham well encountered the chert at 3,410 ft. with 17,000 cu. ft. of gas at 3,468 ft., and the Oriskany sand at 3,531 ft. New York State Natural Gas Corp. 1-N-225 Orville Kitzmiller, elevation 2,403 ft., is below 4,148 ft., with the Oriskany logged at 4,104 ft., Eagle Oil & Gas Co. 1 Emil Germain is currently shut down at 4,106 ft.; on an elevation of 2,420 ft., this well found the Onondaga at 4,005 ft.

West Virginia:—One dry wildcat completion and 41 new locations scattered over 10 counties were announced the past week. The dry test, which may be plugged back and produced from the upper formations, was Cumberland & Allegheny Gas Co. 425 Jason Harmon in Dry Fork district, Tucker County (see wildcat paragraphs following).

Pennsylvania.—Two interesting tests have been located in the northeastern part of the state. Fralich et al staked a wildcat on city of Philadelphia land in Burnside Township, Centre County, on Snowshoe Quadrangle, Section D, 2,000 ft. east of the west line and 5,800 ft. south of the north line on Laurel Hill anticline. In Stewardson Township, Potter County, S & M Oil & Gas, Inc., will drill 1 H. A. Heinrich, a semiexploratory venture, on Oleona Quadrangle, Section G, 8,150 ft. east of the west line and 3,400 ft. north of the south line.

MARYLAND SUCCESSFUL WILDCAT

Garrett County: Fox & Trimble 1 McGee, elev. 2,433 ft., 4,500,000 cu. ft. gas from chert at 3,800-25 ft., TD 3,836 ft.

WEST VIRGINIA WILDCAT FAILURE

Tucker County, dry Fork district: Cumberland & Allegheny Gas Co. 425 Harmon, elev. 3,304 ft., dry, Onondaga 8,81 ft., chert 8,333 ft., gas pocket 8,333 ft., Oriskany 8,413-8,561 ft and 8,575-8,630 ft. TD 9,085 ft.

OHIO

COLUMBUS.—Willard Shrider et al 4 H. L. Ringwalt, third quarter, New Castle Township, Coshocton County, showed for 17 bbl. natural and 80 bbl. in 24 hours after shot. The Clinton was logged at 3,215-78 ft.

A. M. Doudna et al 1 Willis Miller, Section 3, Canaan Township, Wayne County, gaged 300,000 cu. ft. in the Newburg, found at 2,710-55 ft., and only a small showing of oil in the Clinton at 3,066-71 ft. The test

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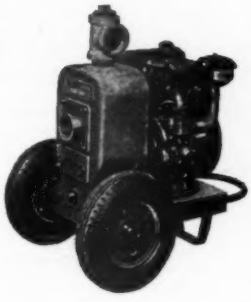

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will be plugged back to the Newburg and shot or acidized.

E. C. McManaway et al will drill a wildcat test just north of the town of Lexington, on the K. J. Cockley tract in Section 13, Troy Township, Richland County.

A ¼-mile extension was brought in by Mid East Oil Co. on S. M. Gutridge, Lot 20, Hopewell Township, Licking County. Clinton at 3,050-95 ft. made 10 bbl. natural and 44 bbl. in 21 hours after shot.

OHIO WILDCAT FAILURE

Richland County, Jefferson Township: Fierbaugh & Ringler 1 O. J. Leedy, Sec. 35, TD 2,460 ft., Clinton 2,315-25 ft.

Permian Basin

New Spraberry Field Looms in Martin County

MIDLAND.—Another Spraberry field was in prospect at week's end. This one is in the southeastern corner of Martin County, some 50 miles north of Germania pool, and about 1 mile north and slightly west of the town of Stanton.

The well is Ryan Consolidated Petroleum Corp. 1 Willie Peters. First 3-hour drill-stem test in the Spraberry from 7,072-7,206 ft. recovered 3,300 ft. of clean oil with no water. Operators were to run a longer test of the same section. Top of the formation was 7,072 ft., and minus 4,360 ft.

West of Stanton, Tide Water Associated Oil Co. 1 Dickenson was waiting on cement after setting casing at 11,880 ft. Drill-stem test in the Siluro-Devonian at 11,740-780 ft. recovered 360 ft. of oil, with no water reported. Second test between 11,748-801 ft. developed oil-cut water.

Northeast of Stanton, Phillips Petroleum Co. 1-A Clinton was rigging up cable tools at 6,603 ft., total depth. No shows have been reported in the well.

In the same area, Pentex Oil Co. 1 Ruby Ragland was called dry at 7,542 ft. Tests in the Spraberry from 7,264-7,348 ft. developed some oil with considerable salt water.

In Flat Rock field, Southeast Upton County, Slick-Urschel Oil Co. 1-AB University found the Ellenburger dry but had prospects of making a well in the Spraberry. Location is a ½-mile northwest offset to Cities Service and Continental 1-AH University which had flowing oil on a test of the Spraberry but completed as a gas-condensate discovery in the lower formation.

Slick-Urschel's test topped the Ellenburger at 11,400 ft., elevation unreported, was drilled to 11,740 ft., then plugged back to around 7,300 ft. after tests developed salt water.

Hydrafrac treatment of the Spraberry between top at 6,420 ft. and 7,300 ft. resulted in a flow of around 49 bbl. of oil in 24 hours, through 20/64-in. choke.

South of the discovery, Cities Service and Continental 1-AM University was swabbing on perforations at 10,436-476 ft., in the Fusselman. Recovery had not been reported.

WEST TEXAS (DISTRICTS 8 AND 7-C) SUCCESSFUL WILDCATS

Borden County: Stanolind Oil & Gas Co. 1 R. C. Miller, 3-30-5N-T&P, TD 8,645 ft., elev. 2,514 ft., Spraberry 5,280 ft., Ellenburger 8,558 ft., PB 5,535 ft., treated 5,265-5,400 ft., IP pumped 157 bbl. 38°-gravity oil a day, some water, GOR 95 cu. ft.

Midland County: Moore Exploration Co. 1-A R. Bauman, 14-38-2-S-T&P, 3 mi. SE Midland, TD 11,293 ft., elev. 2,778 ft., Pennsylvanian 10,750 ft., lower Pennsylvanian pay 11,284 ft., IP flowed 226 bbl. 47°-gravity oil a day, ⅛-in. choke, GOR 1,821 cu. ft., TP 1,050 psi.

Reagan County: Paul F. Barnhart 1-15 G. F. Wimberly, 15-C-L&SV, 38 mi. NW Big Lake, TD 6,900 ft., elev. 2,693 ft., Spraberry 6,795 ft., IP flowed 176 bbl. 37°-

gravity oil a day, 20/64-in. choke, GOR 880 cu. ft., TP 140 psi.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Andrews County: Stanolind Oil & Gas Co. 1 H. E. Chesley, 6-A37-PSL, dry, TD 7,800 ft., elev. 3,408 ft., Tubb 6,700 ft., Wichita 7,340 ft.

Coke County: Stanolind 1 Emma C. Nicholas, 337-1A-H&TC, dry, TD 6,918 ft., elev. (?), Strawn 5,260 ft., Ellenburger 6,324 ft., Hickory 6,869 ft.

Concho County: S. D. Johnson 1 A. L. Lockett, W. Gotthardt Sur. 2,044, dry, TD 4,000 ft.

Crane County: Texas Gulf 1 Texas American Syndicate, 25-4-H&TC, dry, TD 8,600 ft., elev. 2,449 ft., Devonian 5,860 ft., Simpson 6,820 ft., McKee 7,465 ft., Ellenburger 8,350 ft.

Edwards County: J. C. Wynn and Humphrey 1 Peterson, 69-E-HE&WT, dry, TD 6,517 ft., elev. 2,295 ft., Mississippian 4,545 ft.

Floyd County: Houston Oil Co. 1 J. S. Lackey, 11-D2-GC&SF, dry, TD 10,395 ft., elev. 3,174 ft., reef 8,466 ft., Mississippian 9,500 ft., granite wash 10,320 ft.

Schleicher County: Stanolind 1 R. J. Hill, 135-A-HE&WT, dry, TD 8,206 ft., elev. 2,412 ft., Canyon 5,150 ft., Strawn 7,165 ft., Ellenburger 7,340 ft.

Terry County: Gulf Oil Corp. 1 T. L. Lowe, 81-T-D&W, dry, TD 12,307 ft., elev. 3,324 ft., Spraberry 7,475 ft., reef 10,900 ft., Mississippian 11,370 ft., Silurian 11,954 ft., Ellenburger 12,220 ft.

Tom Green County: Union Oil Co. 1 J. Wiley Green, 128-11-SPRR, dry, TD 5,710 ft., elev. 1,883 ft., Strawn 4,883 ft., Ellenburger 5,697 ft.

Ward County: Gulf Oil Corp. 272 Hutchings Stock Association, 77 - N - G&MMB&A, dry, TD 7,012 ft.

C. S. Messinger 1 J. W. Sweatt, 201-34-H&TC, dry, TD 4,892 ft.

TEXAS PANHANDLE (DISTRICT 10) SUCCESSFUL WILDCAT

Hansford County: J. M. Huber Corp. 1 Man Womble, SW SW 27-3-GH&H, SW corner of county, TD 5,416 ft., elev. 3,353 ft., perforated Pennsylvanian 5,266-5,355 ft., IP flowed 50 bbl. oil, 1,876,000 cu. ft. gas a day, ½-in. choke.

Mississippi

Union Perforates at Test On New Glazier Dome

JACKSON.—On the recently discovered Glazier Dome, in Perry County, Union Producing Co. perforated a total of 112 ft. with 8 shots per foot out of 311 ft. between 7,088-7,399 ft. in A-1 B. M. Stevens, 19-4n-9w. These perforations are in thin Upper Tuscaloosa sands which carried shows of heavy black oil. A drill-stem test of these perforations recovered 2,740 ft. of estimated 10°-gravity oil in 17 hours. No salt water was recovered and bottom-hole flowing pressure was 1,075 psi.

This test encountered cap rock at 7,476 ft. and salt at 7,685 ft. If completed as an oiler, it will establish the first commercial oil production from a piercement salt dome in Mississippi.

Dave Gammil-Lyle Cashion Co. 1 D. F. Anderson, 3-5n-1e, Franklin County, is shut in for storage after testing oil through casing. Through perforations in the Baker zone of the Wilcox, the well flowed at the rate of 75 to 100 bbl. of oil daily through ⅛-in. choke. Flowing pressure ranged from 435 to 450 psi.

In the Russum area of Claiborne County, Dorris Ballew, Inc., et al, 1 J. Davenport-H. King Estate Unit, wildcat in 68-11n-2e, is drilling ahead in Lower Cretaceous after encountering no oil or gas shows in the Lower Tuscaloosa. The wildcat has a projected depth of 11,500 ft. and is now drilling at 10,070 ft. This test ran from 20 to 30 ft. lower structurally on various correlations in the Lower Tuscaloosa than the Amerada 1 Hewes-Rodney, dry hole located approximately 1 mile to the west.

Church Hill field in Jefferson County received a setback when Lyle Cashion Co. A-1 Carrie M. Allen, 3-8n-2w, was abandoned at total depth of 5,853 ft. in Wilcox. This test had top of Artman sand at 5,512 ft. (—292 ft.) which is 31 ft. lower structurally than Kirby 2 Wood, located approximately ½ mile northeast.

Davis is Assistant, C.F.&I. Executive Vice President

Effective immediately, Howard J. Davis is appointed assistant to Colorado Fuel & Iron Corp., executive vice president, A. F. Franz.

Davis came to C.F.&I. in 1940 to establish a welded wire fabric division at the Pueblo mill. In June 1947 he was appointed manager of product research and development, later named manager of sales for wire products. In April 1949 he was made assistant general manager of commercial sales for the Colorado division.

In April 1951 he was made assistant to the vice president of sales. Franz stated that Davis is to be located at the C.F.&I. general office in Denver.

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Oklahoma

Second Well Indicated For New Marlow Area

THE indicated new Hoxbar sand pool recently discovered by Shell Oil Co. at its 1 Tugman, NE SW NE 11-2n-8w, 2½ miles west of Marlow, in northern Stephens County, southern Oklahoma, has another prospective well in a north offset drilled by Magnolia Petroleum Co. Both wells now have oil strings run preparatory to production tests.

Magnolia's offset well, also 1 Tugman, located in the SE NW NE 11-2n-8w, logged the sand at 6,053 ft., and a drill-stem test at 6,056-69 ft. flowed gas estimated at 750,000 cu. ft. per day and 40°-gravity oil estimated at the rate of 30 bbl. per hour. Gas started to flow within 5 minutes after the tester was opened. Oil was at the surface within 30 minutes. Tool was open 49 minutes. Approximately 1,980 ft. of oil and 60 ft. of oil-cut mud was recovered when pipe was pulled. Hole then was cored an additional 10 ft., recovering 3 more ft. of oil saturated sand and 3½ ft. of shaly sand.

Shell's indicated well checked the sand at 6,073 ft. and tested an interval at 6,078-6,112 ft. getting an oil flow estimated at 20 bbl. an hour with a breakdown recovery of 380 ft. of oil. Since then it has been drilled to a total depth of 10,006 ft., getting additional substantial oil and gas showings in several lower zones, drill-stem tests in which have been reported previously.

The area is 2 miles southwest of the 2-well Northwest Marlow pool and about the same distance southeast of the Beaver pool, a 1950 discovery.

Stephens Petroleum Co.'s new Humphrey (Springer) sand discovery well, 1 Haas, located in the NW SE NE 9-2s-3w, a mile west of production in the Sholem Alechem field and 1½ miles north of the Fox-Graham pool, also in Stephens County, flowed more than 290 bbl. of oil during a 16-hour gage through 29/64-in. choke. Casing was perforated opposite the upper zone at 6,408-18 ft. Operators plan to perforate and test a lower zone in the same horizon before completing the well.

Testing also is under way at another Stephens County outpost discovery well, Continental Oil Co. 1 Adams-Von Weise, NW SW NW 15-2s-4w, 2 miles south of Alma and south of production in the Velma pool. Latest tests are in the Tussey zone with casing perforated at 3,680-3,720 ft. Load oil was recovered and 18 bbl. of new oil produced by swabbing in the first 13 hours.

A new Hunton lime pool is in the making in southeastern Lincoln County where Flynn Oil Co. is testing its 1 Terry, SW SW SE 14-12n-6e, about 3½ miles northeast of Prague. Open hole at 4,390-4,410 ft. was acidized with 2,000 gal., and at latest report the well was swabbing and flowing to the pits with production estimated good for 75 bbl. of oil per day.

In Washita County ¾ mile southeast of nearest production of the Elk City field, United Carbon Co. 1 Z. Music, C NW SE 28-10n-20w, got a gas flow estimated at 1,000,000 cu. ft. of gas daily and recovered 1,550 ft. of distillate and 300 ft. of heavily oil and gas-cut mud in a drill-stem test of a Granite Wash zone at 9,697-9,725 ft. Test lasted 100 minutes. Flowing pressure was 150 psi. at the top and 750 psi. at the bottom. Shut-in bottom-hole pressure was 3,800 psi. Nearest production is at Max Pray and associates 1 Proctor, C NW 28-10n-20w, also a southeast outpost well.

OKLAHOMA SUCCESSFUL WILDCATS

Carter County: Schermerhorn Oil Corp. 3 McGill, NW SE SE 8-3s-2w, pumped 8 bbl. 30°-gravity oil from fusilinid sand at 2,487-3,500 ft., Tussy sand at 2,743-91 ft., broken sand at 3,138-68 ft., TD 4,430 ft., geological test in Fox-Graham.

Lincoln County: Hubbell & Webb 1 Hill, NW NW NW 10-14n-6e, flowed 576 bbl. oil from second Wilcox at 3,806-36 ft. and Tyner at 3,848-69 ft., TD 3,943 ft., geological test in Stroud.

Logan County: Ashland Oil & Refining Co. 1 Baker, NW NW NE 9-19n-4w, flowed 33 bbl. 39.6°-gravity oil from lower Layton at 4,780-98 ft., TD 4,840 ft., extension to Northeast Marshall.

Major County: Mazda Oil Corp. 1 Loomis, NE SE SE 21-22n-11w, flowed 162 bbl. 42°-gravity oil from Manning at 6,766-6,836 ft., TD 6,903 ft., 2 mi. NW Ringwood.

OKLAHOMA WILDCAT FAILURES

Bryan County: W. E. Allaun 1 Barakat et al, SE SE NE 7-6s-8e, dry, TD 5,744 ft.

Carter County: W. B. Moran 1 McDowell, SW NE NE 34-4s-2w, dry, TD 4,715 ft.

Cotton County: Clower-King & Ross 1 Breuer, NE NE SW 30-4s-9w, dry, TD 1,920 ft.

Jackson County: Johnson 1 Robinson, SE SE NW 17-1n-23w, dry, TD 8,010 ft.

Jefferson County: The Texas Co. 1 Howard, NE NE NE 14-6s-4w, dry, TD 7,115 ft.

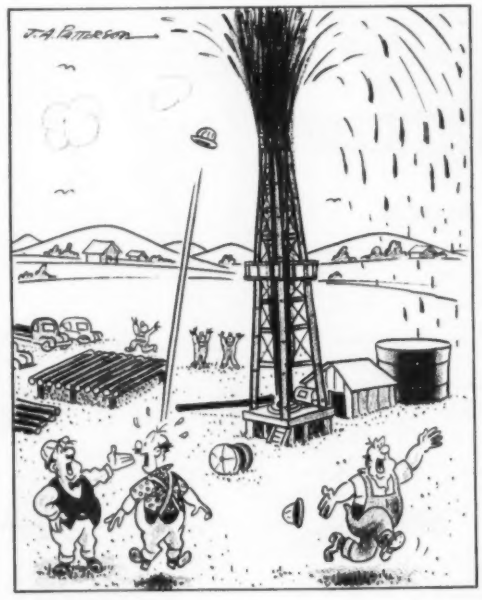
Lincoln County: W. A. Delaney, Jr. 1 Knesek, NW NW NW 22-13n-5e, dry, TD 3,597 ft.

McLean and Kelorma Oil Co. 1 Ringer, NW NW SE 30-14n-5e, dry, TD 3,888 ft. Rives 1 Langley, SE SE SW 12-16n-6e, dry, TD 3,362 ft.

Love County: J. R. & Adam Seitz 1 Spivey, SW SW SE 30-7s-3w, dry, TD 4,750 ft.

Noble County: Aurora Gasoline Co. 1 Wilson, NE NE SE 27-23n-1e, dry, TD 3,349 ft.

Okfuskee County: Huffman-Malloy-McLean 1 McMahan, NW NW NE 5-11n-10e, dry, TD 3,175 ft.



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Pawnee County: Bradley 1 Leen, SE SW SW 14-20n-5e, dry, TD 2,865 ft.
Mid-Continent 1 Thomas, NW NE SW 5-20n-7e, dry, TD 2,902 ft.
Ramsey 1 Walenciak, SW SW SW 14-22n-4e, dry, TD 3,960 ft.
Payne County: Evans 1 Coble, SE SE SE 11-19n-6e, dry, TD 3,378 ft.
Pontotoc County: Van Grisso and Republic Natural Gas 1 Norris est., NE SE SE 27-2n-6e, dry, TD 5,855 ft.
Burgin 1 Bumpers, SE NW NW 35-4n-4e, dry, TD 2,166 ft.
Southwest Natural Prod. 1 Wood, SE NW SE 22-5n-4e, dry, TD 3,089 ft.
Stephens County: Goldsmith & Perkins et al 1 Stanley, SE SE NW 34-1s-7w, dry, TD 5,640 ft.
Nye and Vickers Petroleum 1 Tovetty, NE SE NW 14-1s-9w, dry, TD 3,060 ft.
Woodward County: Sinclair et al 1 Community O. Z. Morrow, C SE SE 6-23n-19w, dry, TD 10,238 ft.

Canadian Fields

Shallow Heavy-Crude Discovery to Set Pump

CALGARY.—Tor American Oils, Ltd., is preparing to install pump unit at its Bonnyville area well that found heavy crude in the Colony sand horizon. The well, Tor American 1 Bonnyville, in LSD 11, 29-60-5w4, located in central-east Alberta, also found natural gas in the Colony horizon, rated at nearly 2,000,000 cu. ft. daily.

Hole completed drilling at 1,178 ft. and set string of 7-in. production casing at that depth. Gun perforations in the interval 1,171-76 ft. were carried out with 6 shots per foot and production tests commenced. During bailing operations carried out over the past few days, the well is said to have indicated a potential of around 50 bbl. of oil daily. No water was reported. Gravity of the black oil is about 13°.

Dome Exploration (Western), Ltd., has obtained an oil showing at its key deep test in the Drumheller area, 1 mile southeast of Naco-discovered Lower Cretaceous oil pool. The showing has come about 800 ft. below the level of the Cretaceous pool, around 5,400 ft., in a formation not yet designated.

While unofficial reports indicate that the oil showing was of substantial proportions, the official statement is confined, pending further evaluation, to confirmation that an oil show has been obtained on drill-stem test. The well, Dome-Naco 30-14 Drumheller, in LSD 14, 30-29-19w4, is now at 5,415 ft., coring and testing.

Dome Exploration, in May, acquired by purchase a substantial interest in Naco, Ltd.'s, three oil wells, one gas well, and checkerboarded spread of leases in the Drumheller area, and assumed direction of the project. The Dome-Naco southeast step-out proved a failure in the Lower Cretaceous sand from which the Naco wells produce, and has been deepening for test of lower formations.

The area involved is checkerboarded in leases, with the Dome-Naco team the largest participant. Great Plains Development Company of Canada, Ltd., and Okanagan Petroleums, Ltd., share equally in a 2,676-acre checkerboarded spread. The team of Anglo Canadian Oil Co., Ltd., Security Freehold Petroleums, Ltd., and Calmont Oils, Ltd., share equally in some leases in the area.

Anglo-Home-C. & E. team has staked location for another driller in the Camrose-Viking sand oil area of central Alberta. That team, discoverer of the Viking oil in that area, has to date successfully completed five Viking oil wells on its joint property at Camrose. The new location is Anglo-Home-C. & E. 8 Camrose in LSD 2, 32-47-20w4, ¼ mile north of Camrose 7 oil well.

CANADIAN SUCCESSFUL WILDCATS

Imperial-Bremner 1, LSD 9, 31-53-21w4, TD 4,933 ft. capped gas well.
Imperial-Jarvie 2, LSD 7, 22-63-1w5, TD 3,152 ft., capped gas well.

CANADIAN WILDCAT FAILURES

Hudson's Bay-Fort Vermilion 1, LSD 15, 32-104-8w5, TD 3,640 ft.
Socony-Granum 1, LSD 1, 25-11-26w4, TD 8,697 ft.
Great Plains-Hondo 10-1, LSD 10, 1-71-26w4, TD 4,160 ft.
Texaco-McColl-Union 7C-4-7-6, LSD 7, 4-7-6w4, TD 2,876 ft.
Smith-C.P.R. 1, LSD 6, 4-20-12w4, TD 6,064 ft.

Illinois-Ind.-Ky.

Production Indicated in New Monroe City Area

DISCOVERY of another producing spot in the steadily expanding Monroe City area in Knox County, Indiana, appears to have been made by Jack W. McClurg and associates at their 1 Louis Mize in Militia Donation 230-2n-8w. Indicated production is in Rosiclare lime, a drill-stem test of which got a substantial flow of gas and filled 300 ft. of clean oil and 100 ft. of oil-cut mud. Tester was open 2 hours with gas showing at the surface within 42 minutes. Pay zone tested was at 1,502-07 ft. Bottom of the interval still was in saturation. Location of the discovery is 2 miles southeast of the Monroe City townsite and 1½ miles from nearest production.

N. V. and Walter Duncan are opening a new producing area in western Wayne County, Illinois, where their 1 Blackburn, NE NE SE 29-1s-5e, is being put on the pump following swabbing tests in which the well produced at the rate of 265 bbl. of oil. Pay zone is the Aux Vases sand at 2,946-56 ft. with hole open to 2,959 ft. Tests showed only a trace of water. The well, located about 5 miles northwest of Wayne City, is 1 mile south of production in the Coil pool and about the same distance west of the Keenville pool.

In Clay County, Illinois, Quenzil Webster 1 Webster-Roberts, NE SW SW 26-5n-6e, a wildcat a little more than a mile west of the East Toliver pool, 5 miles north of Louisville, flowed initially at the rate of 40 bbl. per hour. Total depth is 2,790 ft. with hole open below 2,780 ft. in McClosky lime.

Three-fourths of a mile east of production in the Parkersburg Consolidated pool, Richland County, Illinois, Calvert Drilling, Inc., 1 James McVaigh, SW SE NE 16-2n-14w, swabbed 112 bbl. of oil natural in 12 hours while testing saturation found in Rosiclare lime at 3,078-88 ft. Total depth is 3,131 ft. One-half mile to the south, the same operator is preparing to test promising oil and gas showings found in both the O'Hara and McClosky zones. The O'Hara has saturation at 3,024-28 ft. A drill-stem test, open 1 hour, got 2,160 ft. of gas, 115 ft. of mud-cut oil, 6 ft. of oil-cut mud, and 5 ft. of water. Drill-stem test, open 1 hour, of the McClosky at 3,060-3,101 ft., flowed gas within 3 minutes and yielded 1,810 ft. of clean oil with only 1 ft. of salt water. Total depth is 3,105 ft. with casing at 3,104 ft.

ILLINOIS SUCCESSFUL WILDCATS

Clay County: Ward W. Dayton 1 Campbell, SE NW SE 11-2n-5e, IP 59 bbl., Cypress 2,505-31 ft., TD 2,535 ft.
Jasper County: Calvert Drilling, Inc., 1 Crews, SW SE NW 24-5n-10e, IP 15 bbl., Rosiclare 2,950-53 ft., TD 2,994 ft.

ILLINOIS WILDCAT FAILURES

Clay County: George & Wrather 1 Hancock, NW SW NW 4-2n-5e, dry, TD 3,037 ft.

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Walter Duncan 1 Golden, NE NE NE 13-3n-5e, dry, TD 2,948 ft.

Clinton County: Oil Management, Inc., 1 Phillip Didier, SE SE NE 18-1n-1w, dry, TD 2,958 ft.

Al Schierman 1 Ackmann, SW NW SE 22-2n-3w, dry, TD 1,369 ft.

H. F. Robison 1 Wiedle, SE SE SW 33-3n-1w, dry, TD 1,228 ft.

J. W. Rudy 1 Fisher, SW SW NE 17-3n-4w, dry, TD 1,133 ft.

E. F. Jones 1 Hummert, SEc NW SW SW 36-3n-4w, dry, TD 2,363 ft.

Fayette County: Simpson Drilling Co. 1 Cain, NW NE SE 34-4n-1w, dry, TD 1,179 ft.

Gallatin County: Skiles Oil Corp. 1 Bauer, NW NW SE 25-8s-8e, dry, TD 2,492 ft.

Jasper County: W. E. Weidler 1 Buller, SE SE NW 2-5n-9e, dry, TD 3,154 ft.

Jefferson County: The Texas Co. 1 Horrell, NE NE NW 14-2s-4e, dry, TD 3,135 ft.

Wayne County: Nash Redwine 1 Lawrence, NE NW NE 11-2s-9e, dry, TD 3,411 ft.

White County: Noah Petroleum Co. 1 Winter, SW SE NW 25-4s-9e, dry, TD 3,293 ft.

J. B. Buchman and C. E. O'Neil 1 Scholk, NE SW NW 16-4s-10e, dry, TD 3,293 ft.

INDIANA SUCCESSFUL WILDCAT

Gibson County: Tuley & Carter 2 Witherspoon, SE SE NW 20-3s-11w, IP 18 bbl., Waltersburg 1,737-50 ft., TD 1,750 ft. (extends Owensville pool).

INDIANA WILDCAT FAILURES

Clay County: Pure Oil Co. 1 Burger, SW NE NE 22-9n-7w, dry, TD 1,929 ft.

Crawford County: Mulzer Brothers 1 Ash, NE NE NE 20-2s-2w, dry, TD 1,811 ft.

Daviess County: H. Eiteljorg 1 L. Meurer, NE NW SW 34-5n-7w, dry, TD 996 ft.

Gibson County: James Snyder et al 1 Dickerson, SW SE SW 27-1s-10w, dry, TD 1,998 ft.

Kennard Oil Co. 1 Dame, SW NW SW 15-2s-10w, dry, TD 2,110 ft.

Harrison County: Berry Stolly 1 Leonhardt, SW SW SE 36-2s-4e, dry, TD 2,032 ft.

Huntington County: F. R. Beasley 1 Buzzard, SW SE NE 2-26n-9e, dry, TD 999 ft.

Knox County: C. E. Skiles 1 Parker, SW SE SW 33-2n-8w, dry, TD 1,339 ft.

Lawrence County: Mid-Globe Oil Co. 1 Bartlett, W½ SE NW NE 8-6n-1e, dry, TD 1,671 ft.

Marshall County: Clifford Perry 1 Stitchter, NW NE NE 31-35n-3e, dry, TD 366 ft.

Montgomery County: Luther Van Horn 1 Foster, SE SE NW 19-17n-5w, dry, TD 2,315 ft.

Pike County: Ryan & Sharp 1 Scraper, NE SE SE 7-1s-7w, dry, TD 1,460 ft.

Posey County: Ashland Oil & Refining Co. et al 1 Searcy, SE SE SE 9-6s-14w, dry, TD 3,037 ft.

Spencer County: Kucher Bermillion 1 Mulzer Brothers, N½ SE NE SE 33-5s-5w, dry, TD 1,196 ft.

Sullivan County: F. B. Cline 1 Butler, NW NE SW 34-8n-10w, dry, TD 2,631 ft.

Vanderburgh County: Slagter Producing Co. 1 Butterfield, SE SW SE 4-8s-11w, dry, TD 1,786 ft.

F. B. Cline 1 Ellis, SW SE NW 10-5s-10w, dry, TD 2,322 ft.

Warrick County: C. E. O'Neal 1 Tooley, SE NE SE 15-6s-8w, dry, TD 1,919 ft.

WESTERN KENTUCKY SUCCESSFUL WILDCATS

Henderson County: Dale Hopkins 1 Phillips, NW SW SE NW 6-O-28, IP 80 bbl., Cypress 1,884-93 ft., TD 1,905 ft. (opens new pay zone Euterpe North pool).

McLean County: George S. Engle 1 Warren, E½ NW SW SW 8-N-25, IP 10 bbl., Cypress 2,014-17 ft., TD 2,017 ft., (discovery well Comer pool).

WESTERN KENTUCKY WILDCAT FAILURE

McLean County: R. Halbert and A. Cotton 1 Whitefield-Kreyling, NW SW SE NW 1-N-25, dry, TD 2,463 ft.

Louisiana-Arkansas

Michael Co. Tests Wilcox Prospect

SHREVEPORT.—Swabbing and testing at J. S. Michael Co. M-1 Nebo Oil Co. et al, LaSalle Parish, indicate a prospective Wilcox strike. Located in NE NE 16-8n-3e, the test was drilled to 4,961 ft. with 5½-in. casing run to 3,550 ft. Oil sands were encountered at 3,410-50 ft. and 3,492-96 ft., with testing operations being conducted at the latter interval.

Another wildcat is being completed as a success. In Richland Parish, C. M. Bagley Co. 1 Federal Land Bank, 8-16n-7e, gaged 45,000,000 cu. ft. of gas from perforations at 2,516-22 ft.

Ada gas field of Bienville and Webster parishes got another oil producer. Carter Oil Co. 1 Leon Walker flowed at the rate of 157 bbl. of oil per day on a test of perforations in the Jeter lime at 5,369-77 ft. Total depth was 5,382 ft.

Winn Parish got two rank wildcat locations when Natural Gas & Oil Corp. staked its 1 and 2 Urania Lumber Co., Ltd., in 12-11n-1e. These wells are more than 6 miles north of production in Tullos-Urania field, a long established Wilcox producing area, and both are scheduled to go deeper to test the Midway.

Arkansas.—Stanolind Oil & Gas Co. has offset its 1 Pine Woods Lumber Co. with a No. 2 well ½ mile to the west. The 1 Pine Woods extended North Shongaloo field from Webster Parish, Louisiana, into Columbia County, Arkansas. The new location is spotted 492 ft. north and 2,582 ft. west of the southeast corner of 10-20n-22w.

No shows since porosity in the Smackover at 10,391-98 ft. have been reported in Carter Oil Co. 1 McMertiss School. The wildcat, 29-19s-20w, Columbia County, is coring at 10,575 ft.

In the northwestern part of the state, Lone Elm field got a good gasser at Arkansas Western Gas Co. 1 Parsley, 15-10n-28w. The well produced 4,000,000 cu. ft. of gas from 2,735 ft.

NORTH LOUISIANA WILDCAT FAILURES

Caddo Parish: Gulf Refining Co. 280 Caddo Levee Board "N," 685 ft. S and 1,985 ft. E NWc 20-20n-16w, dry, TD 8,295 ft.

De Soto Parish: J. F. Lent et al 1 G. H. Harris, 48 ft. N and 1,232 ft. W SEc NE 6-10n-13w, dry, TD 2,001 ft.

ARKANSAS SUCCESSFUL WILDCAT

Johnson County: Pure Oil Co. 2 Low Gap Unit, C NE NW NE 33-12n-24w, 430,000 cu. ft. gas from Atoka at 1,273-87 ft., TD 2,015 ft.

ARKANSAS WILDCAT FAILURE

Columbia County: V. S. Parham et al 1 H. L. Curry, C SE NW 12-16s-20w, dry, TD 3,760 ft.

INTERNATIONAL

(Continued from page 72)
mately 10,000 ft. in the Colorado "M" sand.

Pantepec's net interest in El Roble concession amounts to 17,887 acres.

Favorable Laws Needed

The need for favorable legislation which would permit foreign oil capital to explore for oil in Brazil is emphasized by Joseph E. Pogue, petroleum consultant to the Chase National Bank, in a newly issued 32-page booklet "Oil in Brazil."

Pogue pointed out that a more constructive attitude toward foreign capital would go far to minimize the danger that Brazil's industrial growth will be retarded in the event of a change in conditions upon which the country's present oil imports depend.

Brazil now ranks as the sixth largest consumer of petroleum in the Western Hemisphere and, lacking economic alternate-fuel sources, the trend to oil is inevitable, he said. On the other hand, the oil industry is a mixture of private and state enterprise with the government holding a monopoly on production.

Pogue reviewed present Brazilian legislation ragarding exploration and development of oil and said "Obviously, congressional action is needed to bring the laws up to date and in harmony with the constitution. For the active development of the Brazilian petroleum industry, the best solution would be the passage of a sound and modern general petroleum law which would open the door to free competition by both Brazilian and foreign companies on terms attractive both to the government and to the contractors."

The bank consultant, who is also a director of Gulf Oil Corp., said that although Brazil has immense basins the sediments are too thin to constitute what is regarded as first-class prospects. Furthermore, much of Brazil's potential oil areas are in difficult country where exploration and operating costs would be high. "Incentives should be especially powerful and clearly assured to offset the augmented risks of wildcatting against long odds."

EUROPE

Po Operations

They appear slated for control by government

THE long-standing issue of private vs. government oil operations in Italy's Po Valley appears to be moving toward a decision in favor of tight state control by an over-all government agency.

The Italian Cabinet is reported to have approved a bill setting up the government oil organization and revising the country's mining law. Text of the measure has not been published, but what is known offers little hope that private capital will be able to carry out exploration on any except the most restrictive terms.

The over-all government agency presumably would supervise activities of Azienda Generale Italiana Petroli, the present government oil company, and allow private firms to operate under sublicenses. Some kind of mixed-company operations appears to be contemplated.

Controversy.—There has been intermittent controversy since the end of the war over the Italian mining law. Soc. Petrolifera Italiana, Standard Oil Co. (N. J.) affiliate, developed small crude production prewar but has discontinued exploration in the absence of workable legislation which would allow additional acreage to be taken. A number of private Italian companies also are interested in exploratory work in the Po Valley.

The new law, which oil-company sources say would clinch the virtual government monopoly over the most promising Italian territory, still must be approved by parliament. The set of amendments to the mining law considered in 1949 which would have opened up Italian exploration on conventional terms now appears to have been completely discarded. This has occurred under the continuing pressure of those favoring government operations.

Important area.—The Po Valley is considered to be one of the best potential oil areas in Europe. AGIP has been broadening its exploratory work and has developed an apparent major gas field along with some condensate at Cortemaggiore. A large gasoline-extraction plant has been under construction in the field.

In Rome, a government spokesman recently discussing the proposed revised mining law said the bill safeguards interests of the foreign companies which would be free to continue their work under the government organization. Furthermore, he added, the government monopoly would apply only to the Po Valley and still allow operations as formerly elsewhere.

S.E.G. Affiliation Sought

The recently organized West European Geophysical Union is seeking to affiliate with the Society of Exploration Geophysicists as the West Europe local section.

Founded during the World Petroleum Congress in The Hague, the union has a membership now of 136 exploration geophysicists of various countries in western Europe.

Members of a temporary constitution board of the new union are Dr. A. A. Fitch, Seismograph Service, Ltd., London; A. van Weelden, chief geophysicist of Bataafsche Petroleum Mij. (Dutch-Shell), The Hague; Dr. E. H. Hedstrom, Electrical Prospecting Co., Stockholm; L. Migaux, Cie. General de Geophysique, Paris; Dr. B. Baars, B.P.M., The Hague; and Dr. A. Schleusener, Seismos, Hannover.

Growing Matzen

Russian development is stepping up production

THE largest single oil field in Europe with the possible exception of Romania has been developed by the Russians during the last 2 years in the Vienna basin of Northeast Austria.

Reports filtering out of the area and received in this country by several sources credit Matzen field with a production of between 24,000 and 30,000 bbl. daily.

One American geologist commented that the reports on Matzen show that there may be too much of a tendency in the country to write off the Russians as poor oil operators.

Even the more conservative estimates of Matzen's production of around 24,000 bbl. daily give a present total for all of Austria of approximately 38,000 bbl. daily. The production from Matzen alone is more than twice that of all Austria several years ago.

Mapped prewar.—The Matzen structure was mapped prewar by Rohoel Gewinnvings, A.G. (Socony-Vacuum and Shell). The crude is believed to come from about 6,500 ft. from formations of the Lower Pliocene or Upper Miocene. The same zones are productive elsewhere in the Vienna basin but at shallower depths and in smaller quantities. The Soviet Mineral Oil Administration apparently has encountered higher pressures and better structural conditions at the greater depths.

The installations at Matzen are closely guarded, and scant information is available on activities. The Soviet organization had one blowout shortly after they first began drilling in the field, and there have been others since. Even now a gas well is reported to have been out of control for nearly 2 months.

Stumbling block.—Austria's oil—the fields and refineries—was a major stumbling block in efforts to reach an Austrian treaty which would end the occupation. The Russians up to a year or more ago consistently held up the negotiations and remain in control of the area.

As for Matzen, there is some question as to whether the Soviets may not be overproducing the field, and damaging the reservoir. This occurred in Hungary when the Russian oil organization took control of the fields there shortly after the war.

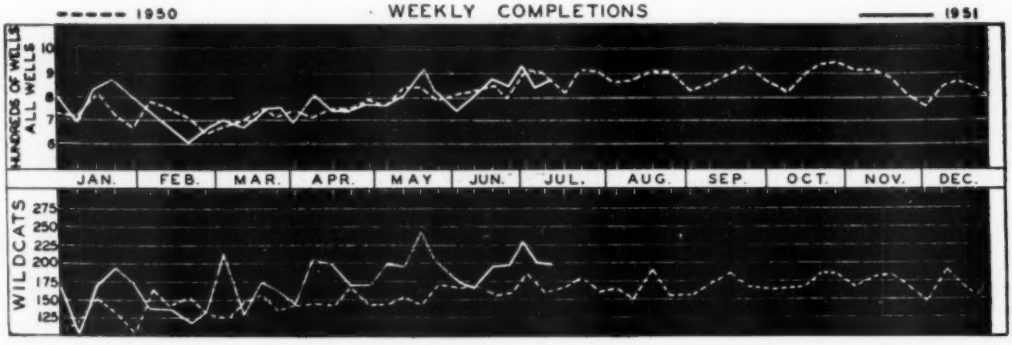
CURRENT STATISTICS

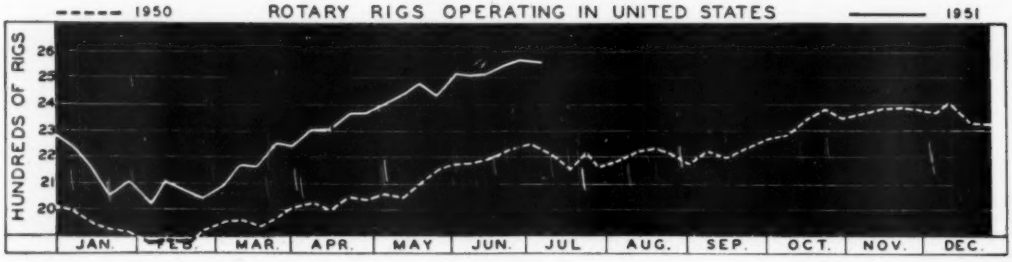
EXPLORATION

WEEKLY WELL COMPLETIONS . . . . . WEEK ENDED JULY 14, 1951

	Total of all wells					July 14		Wildcat completions and discoveries					Cumulative total, 1951				
	Comp.	Oil	Gas	Dry	Footage	1951	1950	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	14	7	0	*7	20,426	250	258	0	0	0	0	0	0	0	0	0	0
Pennsylvania	15	6	2	†7	28,351	381	495	0	0	0	0	0	0	0	0	1	1
West Virginia	11	4	6	1	38,804	294	346	0	0	0	1	1	0	0	6	5	11
Ohio	24	11	3	‡10	41,975	469	514	0	0	0	1	1	1	0	4	15	20
Indiana	49	12	2	35	86,642	607	772	1	0	0	18	19	17	0	1	158	176
Kentucky	32	18	0	14	58,030	581	519	2	0	0	1	3	13	0	1	101	115
Illinois	58	22	0	36	153,380	1,083	1,378	2	0	0	14	16	28	0	0	241	269
Michigan	19	7	0	¶12	44,820	393	¶455	1	0	0	6	7	14	0	6	155	175
Kansas	55	24	1	‡30	189,412	2,240	1,929	2	0	0	13	15	114	0	9	441	564
Nebraska	3	0	0	3	13,374	134	55	0	0	0	2	2	4	0	1	59	64
Oklahoma	112	68	2	‡42	444,228	2,935	2,844	4	0	0	21	25	105	2	15	378	500
Texas	327	190	14	123	1,519,976	8,788	8,529	13	1	3	61	78	382	33	68	1,733	2,216
North Central (Dist. 7-B & 9)	95	33	1	‡61	263,598	2,682	2,632	7	0	0	34	41	187	2	8	752	949
West (Dist. 7-C & 8)	83	64	0	19	504,553	2,643	2,462	3	0	0	9	12	86	8	5	326	425
Panhandle (Dist. 10)	9	4	5	0	30,606	362	511	1	0	0	0	1	2	0	0	13	15
Eastern (Dist. 5 & 6)	36	31	0	5	178,979	652	617	0	0	0	2	2	4	4	0	114	122
Gulf Coast (Dist. 2 & 3)	57	29	6	22	339,187	1,243	1,185	2	0	2	10	14	55	14	36	251	356
Southwest (Dist. 1 & 4)	47	29	2	16	203,053	1,206	1,122	0	1	1	6	8	48	5	19	277	349
Louisiana	39	18	4	17	232,150	1,073	1,307	0	0	0	4	4	24	3	4	135	166
Northern	21	9	4	8	63,749	557	683	0	0	0	2	2	7	0	3	77	87
Southern	18	9	0	9	168,401	516	624	0	0	0	2	2	17	3	1	58	79
Arkansas	6	1	1	4	17,483	201	215	0	0	1	1	2	8	0	2	39	49
Mississippi	9	6	0	3	44,844	165	173	0	0	0	0	0	6	3	0	57	66
Southeastern States	0	0	0	0	0	36	33	0	0	0	0	0	0	0	0	14	14
Montana	14	9	2	3	30,612	122	109	0	0	0	1	1	0	0	0	27	27
Wyoming	20	10	1	9	93,988	376	304	0	0	0	1	1	7	0	0	52	59
Colorado-Utah	4	1	0	3	20,232	136	42	0	0	0	3	3	4	0	3	67	74
New Mexico	18	7	8	3	75,888	354	335	0	0	0	0	0	8	0	7	40	55
California	44	35	0	9	208,800	1,160	917	3	0	0	8	11	26	0	1	229	256
Miscellaneous‖	2	0	1	1	8,866	27	9	0	0	1	1	2	0	0	16	10	26
Total United States	875	456	47	372	3,140,131	21,805	21,538	28	1	5	157	191	761	41	144	3,957	4,903
Total previous week	837	432	64	341	3,262,112	....	....	24	0	7	169	200	733	40	139	3,800	4,712
Total July 14, 1950	821	446	65	310	2,849,480	....	....	23	4	2	136	165	559	41	108	3,225	3,933

Service wells included: *7, †6, ‡1, §4. ¶Revised. ‖Misc. incl. 1 Md. gas well at 3,836 ft., and 1 No. Dak. dry hole at 5,030 ft.





DAILY AVERAGE PRODUCTION FOR WEEK

	July 14 crude oil	B. of M. July demand	July 7 crude oil
Alabama	3,150	2,400	3,150
Arkansas	75,550	85,000	75,550
California	973,200	980,000	973,900
Colorado	73,100	80,000	73,200
Eastern	56,200	64,000	59,900
Florida	1,500	1,600	1,850
Illinois	167,800	162,000	168,800
Indiana	30,500	29,000	30,400
Kansas	305,400	315,000	305,850
Kentucky	29,100	29,000	29,100
Louisiana	610,975	652,000	610,825
North Louisiana	113,400	.....	113,250
South Louisiana	497,575	.....	497,575
Michigan	37,900	42,000	34,800
Mississippi	100,450	104,000	99,900
Montana	23,000	24,000	23,300
Nebraska	6,500	10,000	6,500
New Mexico	147,125	146,000	147,125
Oklahoma	504,250	521,000	505,000
Texas	2,744,750	2,580,000	2,744,750
Dist. 1 (Southwest)	33,050	.....	33,050
Dist. 4 (Southwest)	253,275	.....	253,275
Dist. 2 (Gulf Coast)	160,625	.....	160,625
Dist. 3 (Gulf Coast)	470,825	.....	470,825
Dist. 5 (Eastern)	54,625	.....	54,625
Dist. 6 (Eastern)	115,800	.....	115,800
East Texas field	271,300	.....	271,300
Dist. 7-C (West)	101,100	.....	101,100
Dist. 8 (West)	957,000	.....	957,000
Dist. 7-B (W. Central)	81,875	.....	81,875
Dist. 9 (N. Central)	157,750	.....	157,750
Dist. 10 (Panhandle)	87,525	.....	87,525
Utah	4,000	5,000	3,900
Wyoming	194,500	178,000	195,900
Total United States	*6,088,950	6,010,000	6,093,700
Change from prev. week, down	4,750		
Canada	167,975	.....	114,050

Total U. S. production January 1-July 14 .... †1,154,370,940 bbl.
Same period last year (crude plus cond.) ..... 993,069,015 bbl.

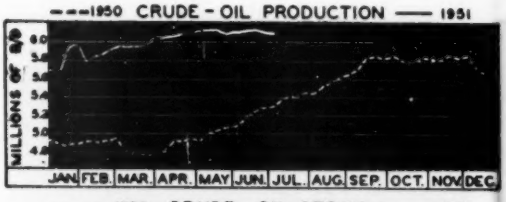
*Not including 100,705 bbl. condensate. †Including 20,746,985 bbl. condensate.

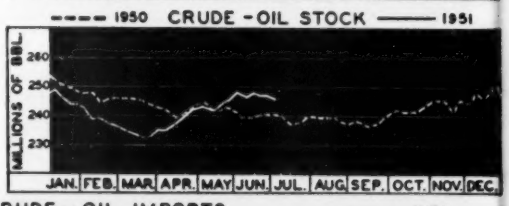
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

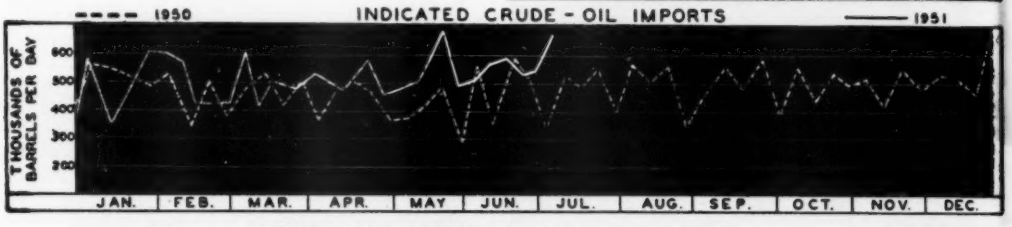
(Thousands of barrels)

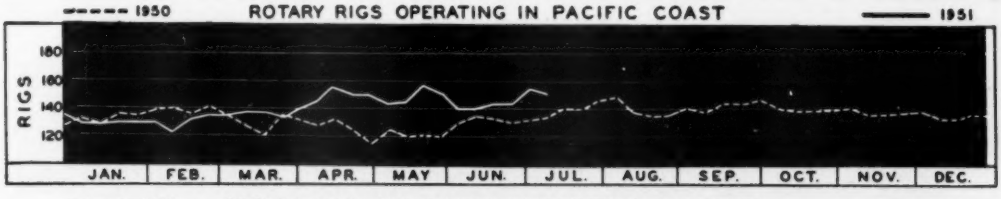
	July 7, 1951	June 30, 1951	July 8, 1950
Pennsylvania Grade	2,111	2,090	2,754
Other Appalachian	1,335	1,471	1,580
Illinois, Indiana, Michigan	11,269	11,036	8,838
Arkansas	2,848	2,879	2,983
Louisiana		14,068	14,107
North	3,011	2,895	3,269
Gulf	11,373	11,173	10,838
Mississippi	2,809	3,076	2,114
New Mexico	6,205	6,742	5,801
Oklahoma and Kansas	37,099	36,913	33,813
Texas	114,479	116,912	111,736
East Texas	14,685	15,112	15,372
West Texas	48,172	48,413	41,522
Texas Gulf	24,714	25,527	26,856
Other Texas	26,908	27,860	27,986
Rocky Mountain	13,784	13,819	12,366
California	30,462	30,493	34,683
Foreign	9,630	†7,800	6,496
Total	245,815	†247,299	237,271

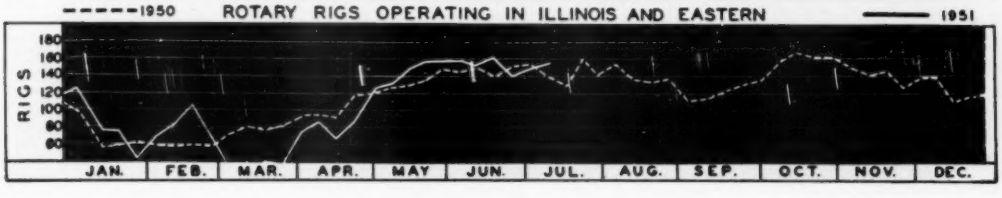
*Bureau of Mines. †Revised.









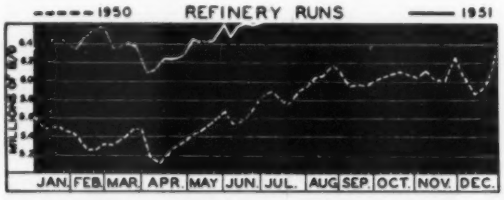


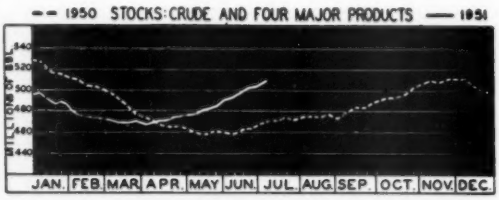
A.P.I. REFINERY REPORT, JULY 7

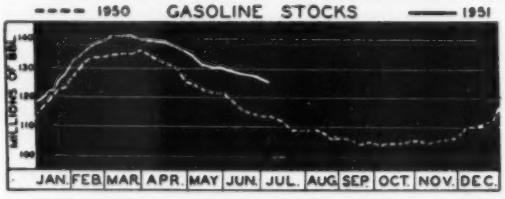
(Thousands of barrels)

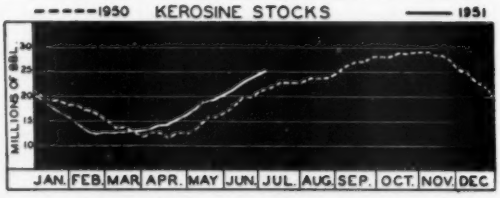
District—	Daily avg. crude runs	Daily average production				Stocks at refineries, bulk terminals, in transit and in pipe lines				Bureau of Mines, July 1950				
		Gasoline*	Kerosine	Distillate	Residual	Gasoline†	Kerosine	Distillate	Residual	Daily avg. crude runs	Daily average production: Gasoline*	Kerosine	Distillate	Residual
East Coast	997	413.2	35.1	221.7	254.6	28,158	9,918	21,040	11,098	964	402.1	34.3	192.9	213.7
Appalachian:														
District 1	108	49.4	5.0	17.3	11.4	2,960	541	775	340	98	44.6	5.1	12.7	10.2
District 2	82	44.7	5.4	5.9	12.4	1,349	318	398	260	71	32.8	3.1	8.3	14.3
Ind., Ill., Ky.	1,228	617.0	82.2	208.6	172.0	28,171	5,087	15,022	4,528	1,090	585.6	53.2	159.8	144.8
Okla., Kans., Mo.	551	291.0	16.4	124.8	69.4	14,488	1,403	8,131	1,609	522	284.9	16.2	106.2	54.7
Inland Texas	263	178.4	15.6	45.4	45.6	3,432	452	1,279	864	214	137.2	10.8	30.2	42.3
Texas Gulf Coast	1,589	711.2	110.3	354.3	268.0	18,426	4,607	8,619	4,503	1,267	595.0	100.3	245.1	229.8
La. Gulf Coast	511	245.7	33.1	122.4	63.9	6,273	1,979	3,701	1,812	487	227.9	47.9	105.1	88.5
N. La. and Ark.	78	30.1	7.4	21.1	9.3	2,512	392	802	103	74	28.4	6.9	13.9	12.3
Rocky Mountain:														
New Mexico	15	8.6		2.9	3.3	112		60	31	14	7.4	3	2.2	3.6
Other Rocky Mtn.	238	110.6	3.9	45.4	47.4	5,322	311	1,609	1,103	196	85.3	5.0	38.2	35.6
California	941	419.7	10.7	117.9	372.4	15,555	438	8,166	16,606	885	403.4	10.2	125.8	320.1
July 7, 1951	6,601	3,119.6	325.1	1,287.7	1,329.7	126,758	25,446	69,608	42,857	5,882	2,834.6	293.3	1,040.4	1,139.9
June 30, 1951	6,595	3,118.3	297.1	1,247.4	1,290.9	127,006	24,142	65,700	41,097					
July 8, 1950	5,912	2,865.6	250.3	1,050.4	1,130.9	114,278	22,035	56,568	41,374					

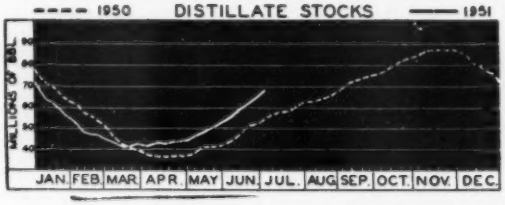
*At refineries including natural blended. †Finished and unfinished.

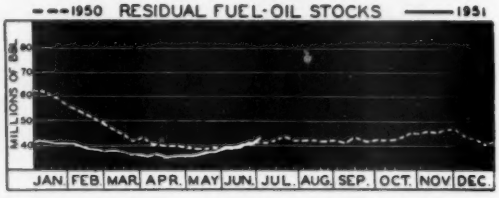


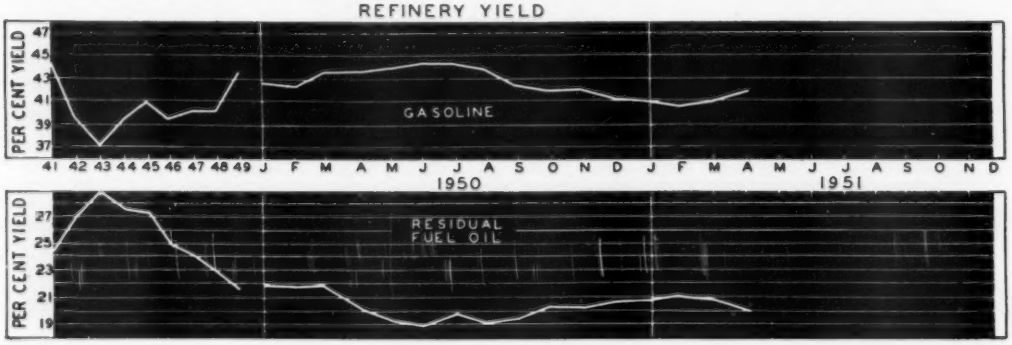











REFINERY YIELD
PER CENT YIELD
GASOLINE
41 42 43 44 45 46 47 48 49 J F M A M J J A S O N D J F M A M J J A S O N D
1950
1951
PER CENT YIELD
RESIDUAL FUEL OIL

CRUDE PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif.‡	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.93	....	....	....
19-19.9	1.98	....	....	....
20-20.9	2.03	$2.25	....	$3.13
21-21.9	2.07	2.27	....	3.14
22-22.9	2.12	2.29	....	2.16
23-23.9	2.18	2.31	....	2.18
24-24.9	2.24	2.33	$2.56	2.20
25-25.9	2.30	2.35	2.58	2.22
26-26.9	2.36	2.37	2.60	2.24
27-27.9	2.41	2.39	2.62	2.26
28-28.9	2.46	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.57	2.45	2.68	2.32
31-31.9	2.62	2.47	2.70	2.34
32-32.9	2.68	2.49	2.72	2.36
33-33.9	....	2.51	2.74	2.38
34-34.9	....	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	....	2.59	2.82	2.46
38-38.9	....	2.61	2.84	2.48
39-39.9	....	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947.

‡Standard Oil Co. of California

FLAT CRUDE PRICES

Representative posted schedules per barrel	
East Texas†	$2.65
Kettleman Hills, California*	2.80
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	4.25
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9°, †35° and above.

DESPITE recent record increases in total distillate stocks, there seems to be at least normal interest in heating-oil buying in the Mid-Continent area. This is probably an indirect effect of the unsettled conditions in Iran and the increase in export sales in this country.

Kerosine exports jumped from 185,000 bbl. in April to 666,000 bbl. in May and distillate exports increased 500,000 bbl. in the same period as a result of the strike at the Abadan refinery that reduced the output at the big Iranian refinery during the last half of April.

With shipments from Abadan suspended since early in July, British oil companies are entering the product markets in this country. Some shipments may be made from the East Coast, but since all extra supplies for this area come from the Gulf Coast, the actual job of supplying part of the needs of Abadan's customers will go to Gulf Coast refiners. Since these refiners also ship by barge up the river into areas supplied by excess production in the Mid-Continent, any pronounced firming of the Gulf Coast market will be felt in the Group 3 area.

Flood waters in Kansas and Missouri are causing some delay in rail deliveries within the area and to northern districts. Also, heavy rains have cut local demand for gasoline. However, this is a temporary condition and normal product movement is expected soon.

Sun Oil Co. announced an increase of 1 cent in posted tank-wagon prices for gasoline in Maryland, Districts of Columbia, Virginia, Vermont, and New York except for New York City and Buffalo. For these areas, this brings Sun's price back to the level that existed prior to the company's general tank-wagon reduction at the end of May. Local price wars at service stations continue, but barge and cargo prices remain firm.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of July 16, 1951. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	10¼-10½	12-12.75	10¾-11
Premium gasoline, 86-88 octane	11¼-11½	13.5-13.75	11¾-12
42-44 w.w. kerosine	9-9⅜	10	9
No. 2 straw fuel oil	8-8⅜	9	8
No. 6 residual	$1.75-1.80	$2.45-2.60	$1.75-1.90

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5½	5	5¼
Grade 18-55	6.6	6.1	6.35

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	13-13.5
750 vis., No. 3-4 neutral	16
2,000 No. 5-6 neutral	18-19

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	29-30
200 vis., No. 3 neutral, 0-10 pp.	17.5-18.5

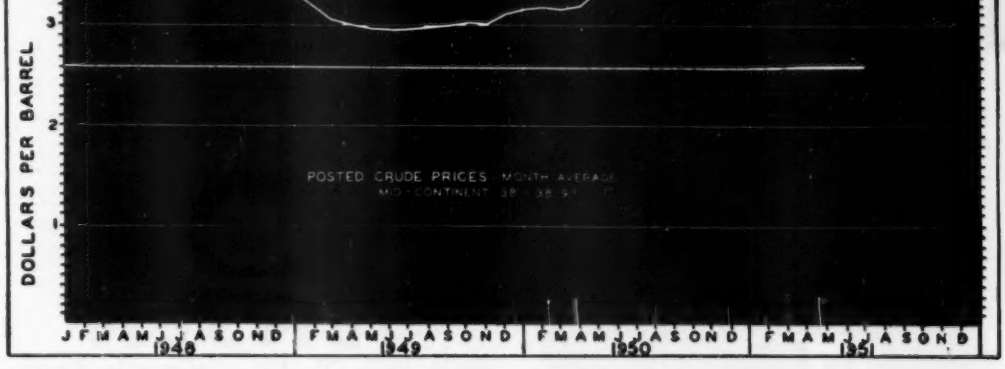
Western Pennsylvania

145-155 vis., 10 p.t. bright stock	32.5
180 vis., 0 p.t. neutral	31.5

WAX

Mid-Continent

132-134 A.M.P.	6.5


PRODUCT REALIZATION
MID-CONTINENT REFINERIES
POSTED CRUDE PRICES MONTH AVERAGE
MID-CONTINENT
DOLLARS PER BARREL
3
2
J F M A M J J A S O N D
1948
F M A M J J A S O N D
1949
F M A M J J A S O N D
1950
F M A M J J A S O N D
1951

In this trend chart refinery realisation is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate, and fuel oil. Realisation averaged $3.49 for week ended July 7, $3.52 for previous week, and $3.43 for July 1950.

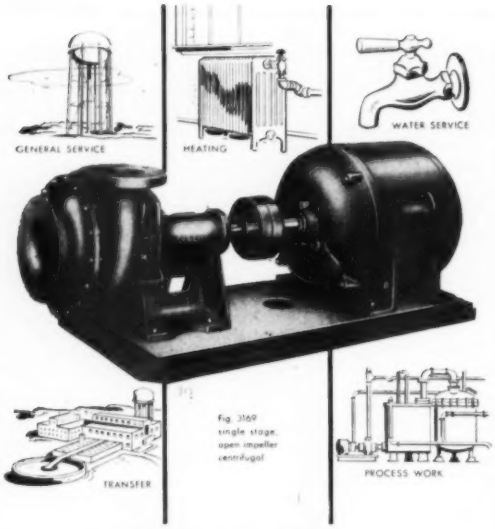


Fig. 3169 single stage, open impeller centrifugal

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Exceptionally Efficient
new
GOULDS PUMP
Designed for Long Service

Here's a new Goulds pump, built to do many different jobs. Especially designed for general water service, process work, slurries, circulation, transfer, and factory wastes, the remarkably versatile 3169 also handles air conditioning, plumbing, heating, and many others.

DEPENDABLE, ECONOMICAL OPERATION

Its modern hydraulic design provides exceptionally high operating efficiency with low power consumption. Ruggedly constructed, yet light and compact, this pump will give you trouble-free service over the long pull.

AVAILABLE IN TEN SIZES

Available in ten sizes for both motor and belt drives, the 3169 has capacities up to 1080 G.P.M.—with heads to 290 ft.

For complete information phone or write Pump Headquarters, Seneca Falls, N. Y. Ask for Bulletin 720.4.

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Geologograph gives you accurate drilling time, guide for bit change, round trip time and shut-down time. Reduces number of failures in drill stem testing! This data — and more — you get with Geologograph — while, at the same time, it frees your "hands" for other important work!

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EQUIPMENT MEN . . . in the News

Lane-Wells Names Hughes To Board of Directors

J. D. HUGHES

James D. Hughes, general sales manager of Lane-Wells Co., has been elected a director of Lane-Wells to fill a vacancy on the board, according to Walter T. Wells, chairman.

Hughes has been associated with Lane-Wells since 1939 and was Gulf Coast division sales manager in Houston from 1941-45 at which time he was transferred to Los Angeles as manager of oil-field sales. In 1945 Hughes was made sales manager and in 1950 he was named as general sales manager.

New Appointments Named By Davey, Paxman

Davey, Paxman & Co., Ltd., Colchester, England, diesel-engine manufacturers, have announced several appointments within the organization.

W. A. Sycamore, M.I.N.A., M.I.Mar.E., who assumes the title of defense program manager, has been appointed to undertake the coordination of the firm's activities and all liaison with the admiralty and other government departments in connection with the national rearmament program.

H. V. Stead, M.Sc., has been appointed commercial manager (engines), and J. A. Bennett-Powell, B.Sc., A.C.G.I., A.M.I.Mech.E., has been named as traction sales manager.

Hudgens Added to Dowell's Cathodic Protection Staff

Ellsworth W. Hudgens has been added to the staff of Dowell Incorporated as a development engineer specializing in cathodic protection for retarding electrolytic corrosion of pipe lines, industrial equipment, and other buried and submerged metals. Hudgens, who will be located in Dowell's general office in Tulsa, was formerly with Gulf Oil Corp. Previous to that he was an instructor in chemical engineering at Missouri School of Mines, at Rolla.

The addition of Hudgens to the staff will enable Dowell to offer a speeded-up, more effective technical service which will aid users of magnesium anodes to obtain a proper installation for maximum cathodic protection.

The cathodic-protection sales division of Dowell is now headed by Herb Walther, who was recently transferred to Tulsa from Dowell's Richmond, Va., area office. R. W. Stetson is the cathodic-protection sales division representative in New York City, and William E. Bunting in Chicago.

Snyder to Distribute Panacalite Products

E. F. Snyder is the world-wide distributor for Panacrete and Panaseal, manufactured by Panacalite Pacific, Los Angeles, a subsidiary of Combined Metals Corp. He has established headquarters in the Jergens Trust Building, Long Beach, Calif.

Atchley, O'Brien Join Midwestern Geophysical

Two top-flight instrument-design and research engineers, formerly on the staff of the Dynamic Analysis and Control Laboratory at the Massachusetts Institute of Technology, have been obtained by Midwestern Geophysical Laboratory, Tulsa, according to M. E. Morrow, president.

R. D. ATCHLEY

D. G. O'BRIEN

Raymond D. Atchley has been elected vice president in charge of engineering. He was engaged at M.I.T. for the past 5 years in the design of hydraulic servo components and instruments for the M.I.T. three-axis flight simulator.

Donald G. O'Brien has been engaged by Midwestern as chief engineer. For the last 2 years he has been project engineer for the M.I.T. single-axis high-speed flight simulator, and was responsible for the design and testing of this important instrument.

Rovang to Occupy New Quarters in Portland

Wallace G. Rovang, president of W. G. Rovang & Associates, Inc., manufacturers of Rovalves, has announced the moving of the firm's plant to the Beall Pipe & Tank Co. location on North Columbia Boulevard, Portland, Ore. The new plant, with a floor space of 40,000 sq. ft., will give the company over 10 times the floor space of its old plant, according to A. F. Laurie, supervising engineer.

In addition to the added space and facilities, the company is installing new equipment. One of the outstanding pieces of equipment is a 400-ton, 12-ft. Pacific Press brake. This machine is capable of bending, punching, drawing, rolling, braking, blanking, straightening, and corrugating. "Micrometer control of this heavy-duty unit, and its resultant accuracy, will be especially helpful in extending our field of manufacture of difficult, heavy-duty forming jobs," explains Rovang. O. E. Rooker is plant foreman for the Rovang organization.

Sewell Products Co. Is New Tulsa Concern

Ben W. Sewell, former research engineer for Carter Oil Co., has resigned to start a new firm which will develop and manufacture tools and equipment for the petroleum industry. The new firm will be known as Sewell Products Co.

While in the employ of Carter, Sewell directed research and development of equipment for drilling, testing, coring, and other specialized purposes. He invented and developed the Carter pressure core barrel which permits recovery of core samples while retaining them under bottom-hole pressure.

Roberts, Davis Named to New Posts by Mack Trucks

T. H. Roberts has been named sales manager of Mack Motor Truck Corp., Dallas branch, according to A. F. Fenner, vice president and sales manager. With Mack since 1948, Roberts was successively bus manager of its southwestern territory, salesman, and most recently, wholesale manager for the Dallas branch.

Garner L. Davis has been appointed

district manager of the Houston branch. During his 5 years with Mack, Davis has been a salesman at the Houston branch and district manager of the Oklahoma City and Dallas branches.

E. B. Badger Merges With Stone & Webster

According to a recent announcement the activities formerly engaged in by E. B. Badger & Sons Co. and Stone & Webster Engineering Corp.'s process division will be carried on in the future by Badger process division of Stone & Webster Engineering Corp. These activities consist of engineering and construction services for clients in the chemical, petrochemical, petroleum, and pharmaceutical industries.

Erastus B. Badger, formerly president of Badger Co., has been elected a director of Stone & Webster, and Ralph D. Waterman, formerly vice president of Badger Co., has been named vice president of Stone & Webster.

Edward Valves Elects Nedderman Vice President

C. W. NEDDERMAN

W. F. Crawford, president of Edward Valves, Inc., East Chicago, Ind., subsidiary of Rockwell Manufacturing Co., has announced the promotion of Carl W. Nedderman as vice president.

Nedderman joined Edward in 1948 and was later appointed assistant vice president. He had previously been president of Universal Camshaft Co., Muskegon, Mich., and also served in executive capacities with Muskegon Motor Specialties Co. and De Vilbiss Co., of Toledo.

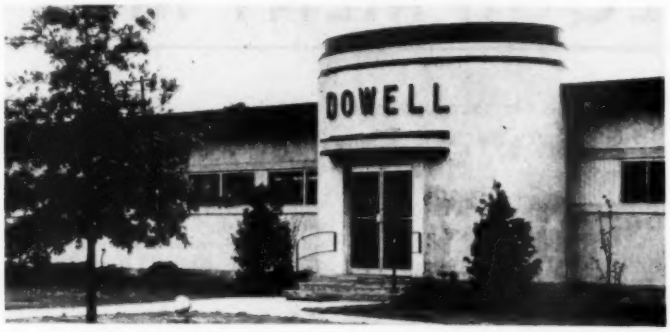
United Centrifugal Pumps Now Made in Canada

An agreement recently concluded between Darling Brothers, Ltd., of Montreal, and United Centrifugal Pumps, a division of the United Iron Works, Oakland, Calif., provides for the manufacture of United's complete line of pumps in Canada.

United has specialized for many years in the manufacture of pumps for the petroleum and chemical industries as well as for petroleum pipe lines and central power stations.

Darling Brothers have completed manufacture of several large units for the new Canadian Oil Co.'s plant at Montreal East, Que., and are presently engaged in production of United process pumps for another major oil company in Sarnia, Ont.

Dowell Constructs New Office Building



Dowell Incorporated has recently occupied this new office building at Tulsa.

A new, modern office building featuring all the latest conveniencies has been constructed in Tulsa by Dowell Incorporated, a wholly owned subsidiary of The Dow Chemical Co. At the same site will be located Dowell's truck, magnesium anode, and chemical manufacturing plants, warehouse, and the engineering research laboratories.

Dowell's purchasing, accounting, auditing, engineering, and maintenance departments have been moved to the new building from the Kennedy building. Offices in the Kennedy building will be maintained for the operations, sales, service, product development, and stenographic departments, as reported by John G. Staudt, executive vice president and general manager.

(Continued on page 165)

Estes Elected Executive Secretary of Nomads

HARRY E. ESTES

Harry E. Estes, sales coordinator of A-1 Bit & Tool Co., has been elected executive secretary of the Nomads national board of regents, effective July 1. He received unanimous approval of the board to succeed Harold M. Cosgrove, retiring secretary.

Estes has been executive secretary of the Houston Chapter of Nomads for 8 years, and will continue in that capacity.

Rolo Mfg. Announces Promotions at Houston Meeting

At a recent meeting of employes and representatives of Rolo Manufacturing Co., Houston, several promotions were announced by R. K. (Bob) Franklin, owner of the crude oil metering company. James L. Kepple was named assistant general manager; W. M. Boren was promoted to chief engineer, and R. G. Oliphant will perform the duties of assistant chief engineer. H. Vernon Smith continues as Rolo's general manager.

Officials present at a recent meeting of Rolo Manufacturing Co., Houston, were: James L. Kepple, H. Vernon Smith, R. K. (Bob) Franklin, founder and owner; W. M. Boren and R. G. Oliphant.

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

CLASSIFIED ADVERTISING

DISPLAY CLASSIFIED
$12.00 a column inch one issue . . .
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UNDISPLAYED CLASSIFIED 12c a word one issue. 10% Discount three or more issues. $3.00 minimum charge. Blind Box in our care counts nine words. Payable in Advance.

EQUIPMENT FOR SALE

USED ROTARY AND CABLE TOOL DRILLING TOOLS, WIRE LINES, E. A. KELLY, BOX 861, OKLAHOMA CITY. PHONE 5-6407.

3600 FEET NEW 2⅞" drill pipe. USED Cardwell RL Model Rotary Rig complete. USED Wilson Titan Rotary Rig complete. General Equipment Co., Inc., 815 Daniel Bldg., Phone 2-6764, Tulsa, Oklahoma.

DRILLING Mud. Colo. Bentonite, it swells, it jells. Few equal, none better. Send for sample. Our price saves you money. Pressey & Sons, Pueblo, Colorado.

BUCYRUS, Ft. Worth, Wichita spudders. Franks, Longyear rotaries. Good used Equipment. Also tools, pipe, cable. Everything for well drilling. Fishing tools rented—Pressey & Son, Pueblo, Colo.

FOREIGN SEAMLESS CASING
A. P. I. Specifications. Subject to letter of credit. Box E-179, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE

Six 125 H.P. Horizontal Clark Engines, Overhead Exhaust. Connected with 3—7¼ X 20 Compressors. Connected with 3—17 X 20 Low Compressors. The best repressure engines on the market for economy and dependability. Located 7 Miles Northeast of Graham, Texas

KNOX REFINING CO.
L. D. 59, Enid, Okla.

100,000 feet
1¼" STANDARD BLACK PIPE
25,000 feet
2" STANDARD BLACK PIPE
20' R.L.
Excellent Used Condition
200,000 feet
2" OD RECONDITIONED SEAMLESS BOILER TUBES
Available for Immediate Shipment
Subject to Prior Sale
Write—Wire—Phone

SONKEN-GALAMBA CORPORATION
2nd and Riverview (X-741)
Kansas City 18, Kansas
THatcher 8143

EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
Box 107, Red Fork Station, Tulsa, Oklahoma

FOR SALE: Seamless casing and tubing new and second hand. Phone Rogers Pipe and Supply Co., Tulsa, Okla.

FOR SALE: R. L. Cardwell with GAK Waukesha, 1st class condition, $5,000. One super model Wilson single drum servicing unit, 80 hp. Waukesha, 4,000' wire, all tubing tools, mounted on GM 4-wheel drive truck. $3500. Phone Rogers Pipe and Supply Co., Tulsa, Okla.

FOR SALE: 2—12" 6,000# QRC Preventers skidded; 2—210 brl. National Welded Tanks; 2—60' American Derricks, 104,000# capacity, portable in 30' sections. Lum Price, 417 E. 16th, Houston, Texas. UNderwood 8945.

FOR SALE

45 Star Heavy Duty Spudder complete with all tools, new Kohler light plant and hand tools. Power: 13000 cat Diesel, 60' steel mast. New wire throughout. Herbert H. Hart, Box 34, Phone 411, Virgil, Kansas, or C. V. Cross, Phone 256, Eureka, Kansas.

EQUIPMENT FOR SALE

PIPE
ALL SIZES; LINE PIPE AND CASING, TANKS, AND OILFIELD SUPPLIES. EDCO PIPE & SUPPLY CO., PHONES 933 OR 1296, DRUMRIGHT, OKLA.

FOR SALE: One drilling rig complete including 137' Lee C. Moore mast and 7,200' of 4½" drill pipe. Rig capacity 7,500 ft. Now operating in Oklahoma. All equipment A-1 mechanical condition. For further details and inspection write Box E-132, The Oil and Gas Journal, Tulsa, Oklahoma.

ONE STRING of cable drilling tools, 5,000 ft. capacity with Parkersburg Rig and Rüse Drilling Motor. Tools to drill 13, 10, 8, and 7-inch holes. Everything in A-1 condition. Complete, $6,500. Contact Weir Walker, R.D. #4, Washington, Pa.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

PIPE FOR SALE!

OIL WELL CASING AND TUBING:

6,200' 2⅜" O.D. 4.6# Used Lapweld, Threaded & Coupled, 11½ Thread.
15,000' 2⅜" O.D. 4.6# Once Run Seamless, Range 2, 10 Rd. Thread.
19,000' 2⅞" O.D. 6.4# Once Run Seamless, Range 2, 10 Rd. Thread.
12,000' 7" O.D. 17# Used Lapweld Casing, T & C, 10 V-Thread.

UNUSED STANDARD BLACK LINE PIPE:

180,000' ½" Standard Black, Plain Ends, 21' Lengths.
45,000' ¾" Standard Black, Plain Ends, 21' Lengths.
120,000' 1¼" Standard Black, Threaded & Coupled, 21' Lengths.
110,000' 1½" Standard Black, Threaded & Coupled, 21' Lengths.
60,000' 2" Standard Black, Plain Ends, 21' Lengths.
7,177' 2½" Standard Black, Plain Ends, 21' Lengths.
3,200' 3½" Standard Black, Plain Ends, 21' Lengths.
15,000' 4" (4½" O.D. x .188" Wall) 8.7# Welded Line Pipe, Beveled Ends, 30'-40' Lengths.
3,000' 5" Standard Black, Plain Ends, 21' Lengths.

UNUSED SEAMLESS STEEL TUBING:

15,000' 2" O.D. x .130/.160" Wall, Random Mill Lengths.
10,000' 2¼" O.D. x .140/.170" Wall, Random Mill Lengths.
15,000' 4" O.D. x .125/160" Wall, Random Mill Lengths.

(The above three items are excellent for welded gas or flow lines and will stand pressure in excess of 1000# p.s.i.)

ACT NOW! PHONE OR WIRE COLLECT YOUR REQUIREMENTS TODAY

A. J. STRUBEL, Broker
SIDney 1791 (Day Phone) HUDson 8152 (Night Phone) 4946 Murdoch, St. Louis, Mo.

EQUIPMENT FOR SALE

FOR SALE: Superior - General Electric natural gas engine - generating unit. 1-685 hp., 480 kw., 327 r.p.m., 480 v., 3-phase, 60-cycle. 1—510 hp., 350 kw., 400 r.p.m., 480 v., 3-phase, 60-cycle. Complete with exciters and generating panels. All in A-1 condition. Will consider selling engine separately. Max E. Landry, Inc., Tulsa, Oklahoma. Phone 5-5639.

LIGHT PLANT: Model 3GG-30 Stewart & Stevenson AC generator, 3 phase, 60 cycle, 30 KW, 1200 RPM, 440 volts, 39 amps., with a Continental Red Seal 6 cylinder motor, all skid mounted. Completely overhauled and in same as new condition. Brown Pipe & Machinery Co., P. O Box 2368 Corpus Christi, Texas, Phone 3-9391.

ONE—6¼" x 30' American HT Drill collar; 1—XAHU Waukesha Engine; 1—13¾" Pilot Surface Bit; 2—4" x 5" Piston Type Water Pumps with engines. B. L. Rucker, Phone 1072 or 480, Mount Vernon, Illinois.

FOR SALE

Good Used 6⅝" O. D. 8 thread line pipe couplings — cleaned or uncleaned. Write or wire Box 574, Tulsa, Okla.

ELECTRIC WELL CASING

20,000' 7" O.D. 17 lb. H40 8 RT R2 No. 1 Used
4,400' 7" O.D. 20 lb. J55 8 RT R2 No. 1 Used

SEAMLESS CASING

2,400' 10¾ O.D. 40.5 lb. J55 8 RT R2 Good Used
1,000' 18" O.D. 61 lb. J55 8 RT R 1 & 2 Good Used

FRANK MORRIS & CO.
4245 S. Cheyenne, Tulsa, Okla. Ph. 1-4247

EQUIPMENT FOR SALE

WELL EQUIPMENT: New and used spudders, rotaries, core drills — all sizes and types. Cable tools, drill pipe, bits, pipe. Fishing tools. Everything for Well Service. Pressey & Son, Pueblo, Colorado.

FOR SALE: Bucyrus Erie Model 24L Spudder, Trailer Mounted, Steel Dog House, some Drilling tools. F.O.B. Bartow, Florida, $6,500.00. Would consider 33W Model or Similar Unit in Trade. H. C. Gardenhire, Jr., P. O. Box 271, Bartow, Florida.

FOR SALE: National 50 rotary drilling rig, NKU Waukesha engines, new Lee C. Moore 130' 515,000# capacity mast with substructure, new 7¼ x 14 Gardner - Denver pump, good drill pipe, everything complete and in first-lass condition. H. Waggoner Drilling Co., Box 4657, Oklahoma City, Okla. Phone 64-1413.

FOR SALE: One 20 H.P. Superior Gas Engine 400-500 RPM; one Caterpillar Diesel Engine Serial No. 7P8091; one 12" X 15" Fairbanks Morse Diesel Engine; one motor generator set 75 H.P. 2300 volt, 3 phase, 60 cycle Motor and 400 amp. 125 volt D.G. Generator. For additional information contact the purchasing agent, Purdue University, Lafayette, Indiana.

FOR SALE

CASING AND TUBING NEW & USED

10000'—7" OD 20# L.W. Used Casing
10000'—5½" O.D. 17# L.W. Used Casing
5000'—5½" O.D. 13# L.W. Used Casing
20000'—2" REG: L. W. R-1 Tubing
7200'—10¾" O.D. 31.20# P.E. G.B. Line Pipe, New
10000'—5½" O.D. 14# S. 10V R-2 Casing, Used
20000'—2" E.U.E. 4.70 10V & 8-R Used S Tubing.

Sabine Machine & Supply Co.
Kilgore, Texas
Phone 3094, 3095, 3436

EQUIPMENT FOR SALE

11,500 GAL. 200 lb. pres. U201 propane tank, 25,000 gal. 75 lb. pres. butane tank. L. M. Stanhope, Rosemont, Pa.

FOR SALE: Two Sullivan Model 22 H.D. Rotary Drill Rigs, one mounted on Ford Truck, One mounted on Half Track, complete with towers, tools, drill rods and Hughes Bits, $6,500.00 each. 1—C.N.P. Electric Driven 10x12 Air Compressor complete, $1,500.00. 7—Electric driven Double suction Water pumps, 6" to 12" discharge. 1—21 S Hopper Charge Power dump, water measuring, timing device Mixer, gas or electric driven, $750.00. 1—New Jaeger 10" Gas driven pump, $1,200.00. 1—Owen ¾ yd. Type O double shaft heavy clam shell with teeth, $600.00. 1—2½ yd. Page Dragline bucket, new teeth, $500.00. Lyons Construction Company, Whitehall, Mich. Phone 23515.

MODEL W Cooper double drum Skidwell Servicing Unit, on 1950 Chevrolet, 2 ton twin axle, dual truck complete with tools. Good condition, slightly used. Phone 8-9676, Tulsa, Oklahoma.

FOR SALE: Ideal slush pump, Model C-150. Melton Supply Company, Seminole, Oklahoma.

INGERSOLL-RAND steam horizontal fly wheel type air compressor 128 cfm 100 pressure. General Engineering & Equipment Corp., 803 Carondelet Building, New Orleans, La.

AMERICAN Structural Steel Building, 50' x 77' x 10'. Excellent condition. Location: Shidler, Oklahoma. Alfred B. Kern, 223 Wright Building, Tulsa, Oklahoma.

35 DERRICKS: Used derricks, good condition. Erected in East Texas Field. 122 ft. angle iron; 116 and 81 ft. tubular steel. Available now at bargain prices. Standard Pipe Company, 3211 Main, Dallas. Phone RIverside 6411.

CASING PULLING CONTRACTORS with Hydraulic Equipment: Experienced operators—Pull any size pipe, anywhere. Also will buy wells for salvage. GENERAL CASING PULLING CO., P.O. Box 4387, Oklahoma City. Phone 6-1333.

NATIONAL "50" Compound Double Drum Rig 120' Cantilever Ideco-Moore Mast, 10' substructure, 5000' 4½" drill pipe, this rig complete and in excellent condition. 273 Hermosa Drive, Bakersfield, California. Ph. 53701.

FOR SALE: Used oil barges, excellent for conversion to drilling and material barges. Write Commercial Petroleum & Transport Co., 344 Esperson Building, Houston 2, Texas.

CASING

Have 6,000' of 9⅝" 36 lb. J-55 Seamless Casing on order for third quarter delivery. Would like to trade this tonnage for 5½" or 7" seamless suitable for 9,600' well. Phone 3-8601, Shreveport, Louisiana.

FOR SALE

SEAMLESS OW CASING AND TUBING

10,000' New J55 2⅞" O.D. external Upset 8 RT R2
10,000' New and Used J55 and H40 5½" O.D. 14# 8 RT R2, Used in hole not over 3 days
3,000' New and Used H40—7" O.D. 17# 8 RT R2, Used in hole not over 3 days
900' #1 Used J55—8⅝" O.D. 24# 8 RT R2
4,000' #1 Used J55—7" O.D.—20" (Republic) 8 RT R2, in hole 2 weeks

MICHIGAN CARLON PIPE CO.
20120 Livernois Ave., Detroit 21, Michigan
DIamond 1-1400

TOWERS— HEAT EXCHANGERS

A-1 Condition—Used Less Than Eight Months

IMMEDIATE DELIVERY

2—7' Dia. x 117' 6" x 11/16" and 13/16" Shell, 11/16" Top Head, 13/16" Bottom Head, 50 Bubble Decks, A.P.I.-A.S.M.E. Coded

1—7' 6" Dia. x 59' 6" x 9/16" Shell and Heads, 20 Bubble Decks, A.P.I.-A.S.M.E. Coded

1—1290 Sq. Ft. Unit, 824 Admiralty Tubes, ¾", 16 BWG, 8' Long, 36" OD Shell

2—2165 Sq. Ft. Each, 690 Admiralty Tubes, ¾", 16 BWG, 16' Long, 34" OD Shell

2—2640 Sq. Ft. Each, 840 Admiralty Tubes, ¾", 16 BWG, 16' Long, 37" ID Shell

1—2035 Sq. Ft. Each, 648 Seamless Steel Tubes, ¾", 13 BWG, 16' Long, 34" OD Shell

All Above Unit Shell and Tube Lummus Design, Floating Heads

WIRE — PHONE — WRITE FOR DETAILS

NEWMAN'S, INC.

700 S. Maybelle, Tulsa, Oklahoma

Telephone: LD 635
P.O. Box 1865

BUSINESS OPPORTUNITIES

EXPERIENCED engineer seeks associate with capital to develop Western defense metal property. References exchanged. Box E-236, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT WANTED

WANTED: A rotary, complete depth 6000'. Give price and location. Box 198, Gorham, Kansas.

WANTED: Table 2 MACHINE, depth 3500'. Complete with tools. Give price and location first letter. Box 198, Gorham, Kansas.

WANTED: Rotary to drill 1,000 feet. Percentage in 200 acres near Comanche, Oklahoma, plus paying for use of machine. Write Box 216, Cut Bank, Montana.

WANT EQUIPMENT: Did you find the equipment you wish to purchase in this column? If not, use an "Equipment Wanted" classified advertisement to find it. It is available somewhere and Journal classified advertisements will find it. See box heading for classified rates, or write The Oil and Gas Journal.

WANTED

New or used for immediate delivery—two 30,000 gallon liquid Propane storage tanks. Phone or wire:

R. W. BOOKER & ASSOCIATES
1722 Olive Street — St. Louis 3, Mo.
GArfield 1476

WANTED

New and Used BOLTED TYPE STEEL TANKS
Also WELDED & RIVETED STEEL TANKS in all Sizes
Also New and Used STEEL CASING, TUBING & PIPE
Will Dismantle
Will pay highest prices

Please phone or wire collect

A. GREENSPON PIPE CO., INC.
(In business over 74 yrs.)
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HELP WANTED

AGGRESSIVE OIL EXECUTIVE — Substantial independent producing company wants aggressive, high type, responsible executive as Manager West Texas-New Mexico Division. Applicant should be under 35 years of age, 10 years experience land and geological work preferably West Texas-New Mexico area. Applicant must be equipped to find and negotiate for wildcat, undeveloped, and developed properties and leases, appraise submittals, manage present West Texas office. Excellent compensation. When replying give full details, include photograph. Our present employes not considered for this position. Box E-194, The Oil and Gas Journal, Tulsa, Oklahoma.

TECHNICAL graduate with all around experience on gasoline tests including CFR engine knocktesting. Some supervisory ability necessary. Required for Laboratory in Oklahoma. Reply stating salary expectation. Box E-214, The Oil and Gas Journal, Tulsa, Oklahoma.

MECHANICAL Engineer to be Assistant Chief Engineer of Chemical Manufacturing Plant in Rocky Mountain Area. Must have experience in chemical plant design, plant maintenance and construction. 10-15 years experience preferred. Salary commensurate with ability. Submit complete details and salary required. Box E-235, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN and Domestic Oil Employment Directory covering the oil industry, showing where to apply for jobs. Price $5.00. Oil Industry Mailing List, Box 2603, Tulsa, Okla.

MECHANICAL PETROLEUM ENGINEER

With 5 or more years' experience for Design of Oil Field Equipment.

UNION TANK & SUPPLY CO.
P.O. Box 2092 — Houston 1, Texas

HELP WANTED

WANTED: Petroleum engineer minimum experience 4 years including field operations for General Headquarters office located in Oklahoma City. Apply in writing only giving full particulars. Sohio Petroleum Company, Room 1254, Skirvin Tower, Oklahoma City.

PROCESS Engineer who has had at least five years refinery experience. Southwest Refinery. Box E-232, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

WANTED: Seismologist for permanent assignment division office in Tulsa. Reply Box E-166, The Oil and Gas Journal, Tulsa, Okla.

EXCELLENT opportunity open for engineer capable of directing gas compressor sales program in Southwest. Must have previous experience and acquaintance in the oil and gas companies in that area. Reply to Box E-213, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST

Established independent oil company requires Geologist with general knowledge and experience in petroleum engineering, leasing, reserve studies, contract analysis and negotiations. Must have college degree, minimum of eight years experience in field and office work, and be qualified to direct leasing, exploration and development involving up to $2,000,000 yearly. Permanent position, located in Shreveport, Louisiana.

Replies will be treated confidentially.

Give complete relevant information in letter directed to Post Office Box 4157, Centenary Station, Shreveport, Louisiana.

OPPORTUNITIES FOR TECHNICAL REFINERY PERSONNEL

for

LARGE INTERNATIONAL OIL CO.

Entertaining applications of graduate chemical, mechanical, structural and electrical engineers for refinery engineering assignments at home and abroad.

Engineers with refinery experience and also recent graduates will be considered.

Box E-143, The Oil and Gas Journal, Tulsa, Oklahoma

WANTED ENGINEERS

by

An American oil company in South America

REFINERY ENGINEERS—College degree and several years' experience in oil refinery design or maintenance required.

PIPELINE ENGINEERS—Must be graduate engineer and have approximately 10 years' experience in design, maintenance or operation pump stations, terminals, trunk pipe lines.

MECHANICAL ENGINEERS — Must have Mechanical Engineering degree and several years' experience preferably in oil field operations. Should have knowledge oil field installations, pipeline equipment and pumping operations.

EQUIPMENT INSPECTORS—Graduate engineers with minimum of four years' experience in oil refinery inspection.

CORROSION ENGINEERS—Degree and minimum of five years' experience in corrosion engineering required. Must be able to investigate and recommend solutions to corrosion problems involving land and marine pipelines, tanks, marine equipment, and other mechanical equipment.

Write giving complete address, marital status, education, and complete experience resume.

Box 308-G
Radio City Station
New York 19, New York

HELP WANTED

WANTED: Experienced Podbielniak operator. When applying furnish full details as to education and experience. New Mexico Asphalt and Refining Company, P. O. Box 367, Artesia, New Mexico.

MECHANICAL Engineer who has had actual supervisory experience in refinery of machine shop, pump, engine and turbine repair. Southwest refinery. Box E-231, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Engineer with approximately 10 years production experience, to pump lease and operate well servicing equipment, to live on premises near Casper, Wyoming. State experience, salary and qualifications. Ameera Oil Company, 139 South Beverly Drive, Beverly Hills, California.

EXECUTIVE to head up new department of an engineering company to do exploratory drilling and develop petrochemical opportunities. Top level experience and connections required. Give specific qualifications and experience. Box E-197, The Oil and Gas Journal, Tulsa, Okla.

THE RIGHT MAN: Can you fill the position you have open from the qualifications listed in this column. Men are always looking for an opportunity to improve themselves. Use a "Help Wanted" Journal classified advertisement to find the men you need. See box heading for classified rates or write The Oil and Gas Journal.

RANCHES AND FARM LANDS

OUTSIDE prohibited zone: 103,000 and 85,000 acres well improved hereford ranches. Good grass, plenty water. Price $5.00 per acre including stock. Government certificate of investment furnished. Retain citizenship. Jack Bermingham, Box 2135, Abilene, Texas.

IN OLD MEXICO: 135,000 acres, Tampico district, formerly Empire Oil Co. lease. Best ranch and agricultural land in coastal Mexico. Price $1.00 per acre. Jack Bermingham, Box 2135, Abilene, Texas.

PRODUCTION SOURCE

PRODUCTION BUYERS
Valuation Geologist experienced in checking properties for bank loans desires to represent company looking for production in Oklahoma. Box 211, The Oil and Gas Journal, Tulsa, Oklahoma.

LEGAL BLANKS

BURKHART LEGAL BLANKS since 1908. Oil-Gas (all states), Business, Real Estate, Legal Forms, Leases, Revised With Government Regulations, Commercial Printing. Catalog and Samples on request. Burkhart Printing & Stationery Company, 115 South Cincinnati, Tulsa 3, Oklahoma.

RESORTS

RANCH LIFE at its of TEXAS
Outstanding Dude Ranch - scenic hill country - deluxe cottages - swimming pool - riding - hunting - fishing - sports. Modern Airport, complete aviation service.
Write for folder, rates.
Flying L Ranch
BANDERA, TEXAS

EXPLORATION SERVICE

CORE HOLES

We core hole your acreage with up-to-date equipment. If desired, we do surface and subsurface mapping and run electrical surveys in connection with your coreholing program.
Service anywhere in the United States. Our work is fast, efficient and CONFIDENTIAL.
Contact us for terms and other information.

EL DORADO DRILLING CO.
Box 527, El Dorado, Arkansas

SITUATIONS WANTED

DRILLING Contractor operating in West Texas and New Mexico desires to contact small or medium-sized independent oil company who needs an operating manager. Personal interview desired. Twenty years experience in all phases of the oil industry. Address replies to Box D-644, The Oil and Gas Journal, Tulsa, Oklahoma.

FORMER Independent Oil Operator ten years, with legal education, plus eight years Wall Street experience, desires connection raise funds exploratory well drilling from excess profits taxpayers. Box D-938, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Engineer-Geologist: 31, six years major company experience field engineering and subsurface geology Kansas, Oklahoma, North and South Texas. Desires connection with aggressive independent producer in Mid-Continent or Rockies. Best of references. Write Box E-216, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL Engineer: M. S. Degree, ten years diversified experience in Refining and Natural Gasoline. Age 35. Desire responsible position in Refining, Petro-Chemical or Sales. All replies considered. Box E-217, The Oil and Gas Journal, Tulsa, Oklahoma.

RETIRED Textile Business man, 54, desires association with small operator, can furnish bank reference, run office, operate typewriter. Familiar with credit problems. Box E-219, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No 131, Ph. No. 131, Hobbs, New Mexico.

PLANT SUPERINTENDENT
Competent and experienced. Excellent record of efficient operations, maintenance and construction. Box E-229, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL Engineer desires top level job in small company. 10 years valuable large company experience, mainly pilot plants, catalytic cracking. Box E-233, The Oil and Gas Journal, Tulsa, Oklahoma.

DESIGN Engineer, 20 years experience refineries, power plants, piping, structures, mechanical equipment, 5 years centrifugal pumps, age 45, married, no children, desires position South America. Box E-226, The Oil and Gas Journal, Tulsa, Oklahoma.

MATERIAL ACCOUNTANT, Inventory, Purchasing, Liaison, Joint Interest. Interview desired. Now employed. Box E-227, The Oil and Gas Journal, Tulsa, Oklahoma.

ADVERTISER looking for position where technical, commercial and administrative abilities and experience required. Past experience refining, terminal operations, construction, technical service and sales. University graduate, linguist, excellent references. Presently employed. Box E-228, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER desires new connection. Twenty years operating and engineering experience, refineries, gasoline plants and construction companies. Present employment, Project Engineer. Age 50 years. Box E-198, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST desires return to foreign employment. Total of 22 years foreign experience. Last 13 years in Latin America with major oil company; previous 9 in Near East. Box E-230, The Oil and Gas Journal, Tulsa, Oklahoma.

MECHANICAL ENGINEER, 4 years thorough production and completing training with major, desires connection with established independent. Age 28. MS degree, and now employed. Box E-237, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED Production and Drilling Supt. on both Rotary and Cable Tools. Deep and Shallow wells, work over and completion. Material, Equipment, routine office duties. 39 years of age. Best reference. Box E-238, The Oil and Gas Journal, Tulsa, Oklahoma.

ROYALTIES

PRIVATE PARTY will invest to $200,000 cash in producing Royalty, overright or settled production in small or large deal. Box E-236, The Oil and Gas Journal, Tulsa, Oklahoma.

DEEDED ROYALTIES
San Juan Basin & Permian Basin. Write Harry S. Wright, Wright Bldg., Farmington, New Mexico.

MONTANA ROYALTIES
Millions of acres now leased by world's major companies, with huge drilling play in prospect. For booklet describing Montana geology and oil development, write Landowners Royalty Company, Box 1225, Great Falls, Montana.

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LEASE AND DRILLING BLOCKS

FOR SALE: 50 acre, 10 year lease, Shelby County, Texas, situated in Humble Block, now ready for development. Write for details. C. A. Parker, Office Polley Hotel, Center, Texas.

OHIO Berea shallow wells and acreage. 700 ft. natural, will flood. E. N. Rehler, Allegany, N. Y.

DESIRE finance to re-drill old Brown County shallow pools. W. H. Mahon, P. O. Box 821, Brownwood, Texas.

FOR SALE: Oil and Gas Leases and Drilling Propositions on leases adjoining producing leases. Depth of Drilling 500 to 700 feet. W. P. Harley, Bowling Green, Ky.

WANTED: Proven West Texas leases. Will pay cash and override. Box 2626, Odessa, Texas.

LEA and Roosevelt Counties, New Mexico, Royalty E ½, S 18-T5S-R33E, 30A $175 per acre. Leases N ½ S 13-T11S-R33E; NW ¼ S24-T14S-R36E; E½ S24-T14S-R35E; E½ S13-T15S-R36E 20A undivided in each $50 per acre bonus plus $200 per acre out of production. 1105 W. Symmes, Norman, Oklahoma.

WANTED: PROVEN LEASES
Proven leases on upper Gulf Coast and East Texas wanted for drilling. Finances and casing available to develop proven leases if not too heavily loaded with bonuses or overrides. Map showing acreage, together with subsurface information, or geology, that indicates profitable oil production, together with guarantee you are able to assign acreage, if a satisfactory deal can be worked out, must be furnished. Will only deal with one person in position to make a deal, and will not entertain nebulous or fragmentary deals. Box E-215, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 640 acres Big Horn County, Wyoming (very hot); 20,000 acres in Central and Eastern Montana (scattered counties); 20,000 acres, North Dakota; 30,000 acres, South Dakota; 10,000 acres, Colorado; 30,000 acres, Nebraska (scattered counties). Prices and terms to properly interested parties. Dyer O.J. 1835 Champa St., Denver, Colorado.

SCURRY CO., Etc.: Have suburban lots in Snyder, Stanton, Lott, Quannah, Texas. Want development for oil and gas. V. A. Epps, Pioneer Hotel, Tucson, Arizona.

OIL Leases in Trigg County, Ky., surrounding drilling well, just started. Priced to sell. (Geology L.V.I.) C. P. Taneyhill, Industrial Engineer, P.O. Box 304, Bowling Green, Kentucky.

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Bought and Sold—Any Area
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6635 Delmar Ave., St. Louis 5, Mo.

ADVERTISERS

Aiten's Foundry & Machine Works 143
Aluminum Co. of America 35
American Coating Supply Company 126
American Hoist and Derrick Company 146
American Iron & Machine Works Co. 109
American Locomotive Company 32
Associated Oil Field Rentals, Inc. 145

Baash-Ross Tool Company 141
Baird Mfg. Co. 143
Baker Oil Tools, Inc. 113
Barrett Division of Allied Chemical & Dye Corp. 11
Beckman Instruments, Inc. 128
Bethlehem Steel Co. 1
Brown & Root, Inc. 2
Butler Manufacturing Co. 103
Byron Jackson Co. 111

Cameron Iron Works, Inc. 24
Chicago & Southern Air Lines 152
Chicago Metal Hose Corporation 42
Christensen Diamond Products Co. 134
Classified Advertising 161, 162, 163, 164
Cleveland Trencher Company, The 127
Coates Field Service, Inc. 129
Colorado Fuel and Iron Corp., Wickwire Spencer Steel Division 31
Construction Machinery Co.'s 94
Coppus Engineering Corp. 3
Core Laboratories, Inc. 71
Crane Co. 5
Crose Manufacturing Co., Inc., M. J. 126
Cruitcher-Rolfs-Cummings 127

Darling Valve and Mfg. Co. 142
Dean Brothers Pumps, Inc. 131
Dow Chemical Co., The 40
Dresser Industries, Inc. 116, 136
Drilling & Service, Inc. 150
du Pont 65, 86

Eastman Oil Well Survey Company 21
Fairbanks-Morse & Co. 111
First National Bank & Trust Co. of Tulsa, The 148
Flint Steel Corporation 47
Fluor Corporation, Ltd., The 123
General Electric Company 14, 15
Geolograph Company, Inc., The 158
Glitsch & Sons, Inc., Fritz W. 98
Goodall Rubber Company 118
Goodrich Chemical Company, B. F. (Hycar) 75
Goulds Pumps, Inc. 158
Grancell, I. H. 133
Grinnell Company, Inc. 16
Grove Regulator Co. 39
Guiberson Corporation 49
Gunite Concrete & Construction Co. 124
Halliburton Oil Well Cementing Co. Inside Front Cover, 77
Harbison-Fischer Mfg. Co. 149
Harper Company, H. M. 147
Hazard Wire Rope Division of American Chain & Cable Co., Inc. Inside Back Cover
Hughes Tool Co. Back Cover
Jarecki International Supply Division H. K. Porter Company, Inc. 48
Jensen Brothers Mfg. Co. 158
Jewel Manufacturing Company 123
Johns-Manville Corporation 45
Kaar Engineering Co. 129
Kieley & Mueller 33
Kobe, Incorporated 136
Lane-Wells Company 50
Larkin Packer Company, Inc. 44
Leeds & Northrup Co. 8
Linde Air Products Company, The, Unit of Union Carbide and Carbon Corp. 27
Lockett & Co., Ltd., A. M. 147
Lone Star Cement Corporation 52
Maintenance Engineering Corp. 37
Manning, Maxwell & Moore, Inc. 26
McCord Corporation 129
McNamar Boiler & Tank Co. 108
Midwest Piping & Supply Co., Inc. 90
Minneapolis-Honeywell Regulator Co., Industrial Division 22
Mission Mfg. Company 106
Murphy Diesel Company 9
National Airoil Burner Co., The 124
National Bank of Tulsa 97
National Supply Co., The 17, 18, 19, 20
National Tank Company 166
Nelson Electric Mfg. Co. 111
Nicholson & Co., W. H. 124
Norris Brothers, Inc. 131

Oil and Gas Journal, The 131, 133, 134
Oil Center Tool Co. 144
Oil Well Supply Co. 4
Otis Pressure Control, Inc. 105

Paris Distributor, Inc., Henry H. 102
Parkersburg Rig & Reel Co. 41
Patterson-Ballagh Division of Byron Jackson Co. 112
Pelican Well Tool & Supply Co. 152
Penn Electric Switch Co. 91
Perrault Brothers 129
Petroleo Interamericano 104
Petroleum Distributing Co. 134
Reed Roller Bit Company Front Cover
Rockwell Manufacturing Co. 36
Ross-Martin Co. 151

Schlumberger Well Surveying Corp. 13
Security Engineering Co., Inc. 116
Shand & Jurs Co. 12
Sigmund Pumps, Ltd. 43
Smith Oil Tool Co., H. C. 132
Southern Mill & Mfg. Co. 38
South Texas National Bank 130
Spang-Chalfant Division of The National Supply Co. 20
Spicer Mfg., Div. of Dana Corp. 89
Standco Brake Lining Co. 133
Strom Steel Ball Co. 130

Taylor Instrument Companies 23
Texas Acidizers 135
Texas Company, The 30
Thomas Flexible Coupling Co. 92
Toledo Pipe Threading Machine Co. 10

Ultra Violet Products, Inc. 124
Union Wire Rope Corporation 25
United States Rubber Company 28, 29
U. S. Steel Corp. Subsidiaries 4, 138
U. S. Stoneware Co., The 146
United Supply & Manufacturing Co. 120
Universal Atlas Cement Co. 138
Up-Right Scaffolds 110

Vapor Recovery Systems Co., The 93
Victor Products Corp. 124

Warner Lewis Company 129
Welex Jet Services, Inc. 54
Westinghouse Electric Corp. 6, 7
Wheland Company, The 34
Wickwire Spencer Steel Division, Colorado Fuel and Iron Corp. 31
Willson Products, Inc. 48
Wolverine Tube Division, Calumet & Hecla Consolidated Copper Company, Incorporated 125
Wood's Sons Co., T. B. 124
Wright Chemical Corporation 102

Youngstown Sheet and Tube Company 69

EQUIPMENT MEN

(Continued from page 160)

Insul-Mastic Appoints Coast Branch Manager

George A. Bulmer has been given the position of manager of the newly formed West Coast branch of Insul-Mastic Corp. of America. The announcement was made at the home office of the company in Pittsburgh. Bulmer's headquarters will be in Los Angeles.

Insul-Mastic manufactures protective coatings for the prevention of corrosion in industry, and waterproof coatings for commercial buildings and homes.

Bulmer has had considerable experience in the uses and proper application of Insul-Mastic products as he was formerly associated with the Marine Engineering & Supply Co., an Insul-Mastic licensee. He is a trained civil engineer and has had considerable experience in construction-engineering work.

Duwe Elected President Houston Control

G. L. DUWE

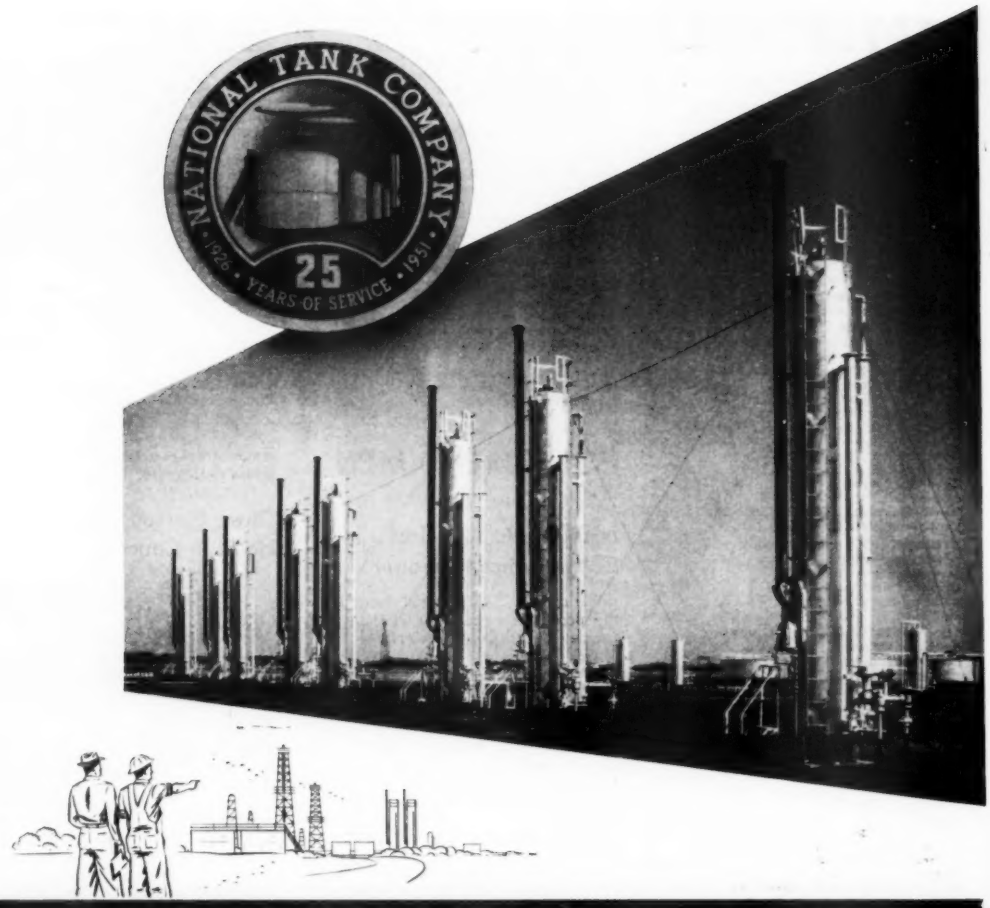
George L. Duwe, comptroller of Cameron Iron Works since 1945, was elected president of the Houston Control of the Controllers Institute of America at the annual meeting held recently in Houston.

The meeting marked the tenth anniversary of Houston Control and honored four of the seven charter members of the group. Two of the honorees present at the meeting were Gay Carroll, controller of Humble Oil & Refining Co., and William A. Baker, vice president and treasurer of Shell Pipeline Corp.

Thornhill-Craver Holds Sales Meeting in Houston

Thornhill-Craver Co., Houston, manufacturers of Unibolt products, held its annual sales meeting in Houston early in June. Those attending were, back row: Frank Baker, W. J. Hill, L. F. Helton, Clint R. Horn, Walter A. Hammann, J. C. Hembree. Front row: M. E. Moore, T. J. Billings, H. E. Thornhill, Earl Grissom, Bert Griffin, J. E. Loeffler, and Kenneth Craver.

TABLE OF CONTENTS ON PAGE 53



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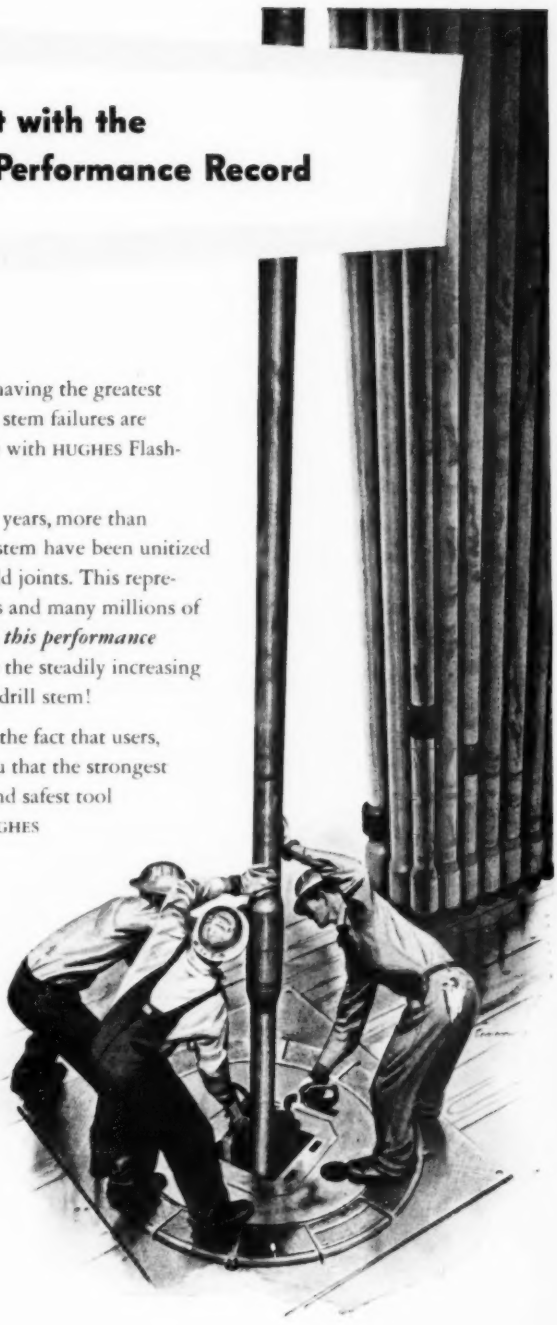

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